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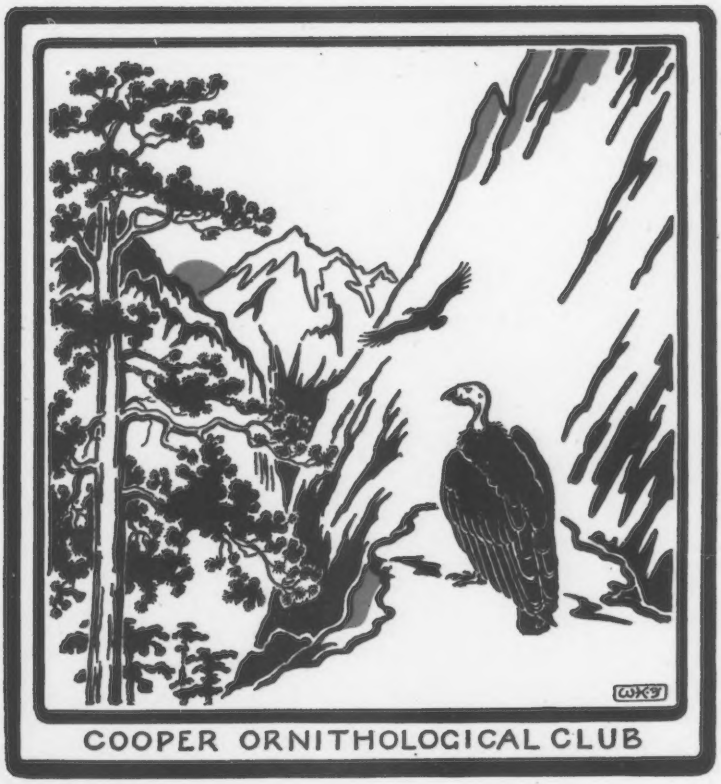
THE CONDOR

A Magazine of Western Ornithology

Volume 45 May-June, 1943 Number 3



COOPER ORNITHOLOGICAL CLUB

THE CONDOR

A Magazine of Western Ornithology

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THE CONDOR

VOLUME 45 MAY-JUNE, 1943 NUMBER 3

A REVISION OF THE RUFFED GROUSE

By JOHN W. ALDRICH and HERBERT FRIEDMANN

There has long been need of a comprehensive study of the geographical variation and taxonomy of the well known North American game bird, the Ruffed Grouse (*Bonasa umbellus*). The writers have at last amassed sufficient material in the United States National Museum, including the Biological Surveys collection of the United States Fish and Wildlife Service, together with specimens loaned by other museums and owners of private collections, to make this possible. In addition to the above, other specimens were examined in the Academy of Natural Sciences of Philadelphia. In all, the material used in this study consisted of 803 specimens assembled in Washington and a large number examined elsewhere. The material, therefore, has been far more ample than that available to any previous investigators.

For first-hand information on the habitat of ruffed grouse acknowledgments are due to Stanley P. Young, Dr. H. H. T. Jackson, Frederick C. Lincoln, Major E. A. Goldman, Dr. Clarence Cottam, and William H. Marshall, all of the Fish and Wildlife Service, and Edward A. Preble, formerly of the old Bureau of Biological Survey; also to Dr. Alexander Wetmore and Dr. Remington Kellogg, of the United States National Museum. To Dr. Alden H. Miller we are indebted for information on the geographic variation of specimens of Ruffed Grouse from western North America in the Museum of Vertebrate Zoology. For the loan of important comparative material we wish to thank John T. Zimmer, of the American Museum of Natural History, James L. Peters, of the Museum of Comparative Zoology, H. B. Conover, of the Field Museum of Natural History, W. E. Clyde Todd, of the Carnegie Museum, Dr. Harry C. Oberholser, of the Cleveland Museum of Natural History, Dr. J. Van Tyne, of the Museum of Zoology of the University of Michigan, Dr. Robert T. Orr, of the California Academy of Sciences, Dr. George M. Sutton, of Cornell University, Woodrow Goodpaster, of the Cincinnati Museum of Natural History, A. M. Brooking, of the Hastings (Nebraska) Museum, A. M. Bailey, of the Colorado Museum of Natural History, Dr. W. H. Headlee, of Purdue University, Dr. D. Eldon Beck, of Brigham Young University, Dr. Angus M. Woodbury, of the University of Utah, M. Dale Arvey, of Boise Junior College, and C. O. Handley, of the Virginia Cooperative Wildlife Research Unit, and Albert F. Ganier, Stanley G. Jewett, Dr. Louis B. Bishop, Dr. Ira N. Gabrielson, Frederick C. Lincoln, and Walter A. Weber, for specimens from their private collections.

PREVIOUS WORK

Tetrao umbellus and *Tetrao togata* were first described binomially by Linnaeus (1766:275), the former based on the Ruffed Heath-cock or Grous of Edwards (1758:79, pl. 248), presumably from eastern Pennsylvania, and the latter based on La grosse Gelinote de Canada, *Bonasa major Canadensis*, of Brisson (1760:207), presumably from the region of Quebec City. W. E. C. Todd (1940:391) has fixed the type locality of *Tetrao togata* as Quebec City.

Stephens (1819:298) placed the above two forms, which he considered as one and the same, together with *Tetrao cupido* Linnaeus, in a separate genus, which he called

Bonasa. Subsequently Gray (1840:62) designated *Tetrao umbellus* as the type of this genus. Douglas (1829:137, 148) described two additional forms from western North America under the Linnaean genus *Tetrao*: *Tetrao umbelloides*, from the valleys of the Rocky Mountains, lat. 54° N., and near the sources of the Columbia River, east of the coast and Cascade ranges, and *Tetrao sabini*, from the coast of northwest America between the 40th and 49th parallels. Todd (1940:393) has further restricted the type locality of *umbelloides* to Henry House, Alberta, and Hall (1934:10) has set Vancouver, Washington, as the restricted type locality of *sabini*.

These four species were reduced to subspecific rank under *Bonasa umbellus* by the American Ornithologists' Union Committee on Classification and Nomenclature (1886: 172-173). Stone (1907:198) renamed the genus of the Ruffed Grouse *Hylobrontes* on the basis of the "first species rule," which Stone thought would be adhered to rigidly by the Committee on Nomenclature. On this basis *Bonasa* would have been transferable to the Prairie Chicken, *Tetrao cupido*. However, subsequent action by the A.O.U. Committee upheld the use of *Bonasa* as the generic name for the Ruffed Grouse as designated by Gray (1840) and that is the genus under which the species has appeared in all editions of the A.O.U. Check-list.

The ruffed grouse of Nova Scotia and New Brunswick were separated and named *Bonasa umbellus thayeri* by Bangs (1912:378) with type locality at Digby, Nova Scotia, and Grinnell (1916:166) described *Bonasa umbellus yukonensis* from Forty-mile, Yukon Territory, on the Yukon River near the Alaska boundary. Other forms that have been proposed are: *Bonasa Jobsii* Jaycox (1871:182) based on birds from Ithaca, New York, and *Bonasa umbellus helmei* H. H. Bailey (1941:1) with type locality at Miller Place, Long Island, New York.

In the most thoroughgoing revision of the species to date, which, however, was confined to eastern North America, Todd (1940) described three additional races: *monticola*, from Cheat Bridge, West Virginia; *canescens*, from Abitibi River, Ontario; and *medianus*, from the Minneapolis region, Minnesota.

H. B. Conover (1935) studied the dark brown *sabini* complex of the Pacific Coast, and separated the Vancouver Island bird, which he called *brunnescens*. At the same time he noted differences in populations from the Olympic Peninsula and from central southern British Columbia, which the present writers are recognizing as separate subspecies. Leonard Uttal (1941:74) studied the geographic variation in the extent of tarsal feathering in ruffed grouse and found significant differences: northern birds in general have the tarsal feathering extending farther down toward the toes than populations from farther south. He suggested that taxonomic revision of the birds, on the basis of this character, might be illuminating. It might be added here that Mr. Uttal has gone over our series with us in connection with the present study and has given us the benefit of his ideas based on a large number of measurements pertaining to the tarsus.

In the most recent systematic treatment of the species, Hellmayr and Conover (1942:214) have followed virtually the racial differentiation set forth in the fourth edition of the A.O.U. Check-list (1931) with the exception of the inclusion of *brunnescens*, from Vancouver Island. Footnote mention was made of Todd's three new races from the eastern part of the continent, *medianus*, *monticola*, and *canescens*, which had been described too late for more thorough consideration.

INDIVIDUAL AND GEOGRAPHICAL VARIATION

Few species of birds are more variable than the Ruffed Grouse. This variability is in part individual, but to a marked degree it has a geographical or racial significance also.

As is well known, ruffed grouse have two more or less well defined color types, the "brown and gray phases," usually indicated by a brown or gray tail, but exhibiting every imaginable intermediate condition. There is also the brown-ruffed condition which may or may not be correlated with tail color. Furthermore there is a well marked size difference between the two sexes, particularly in the tail.

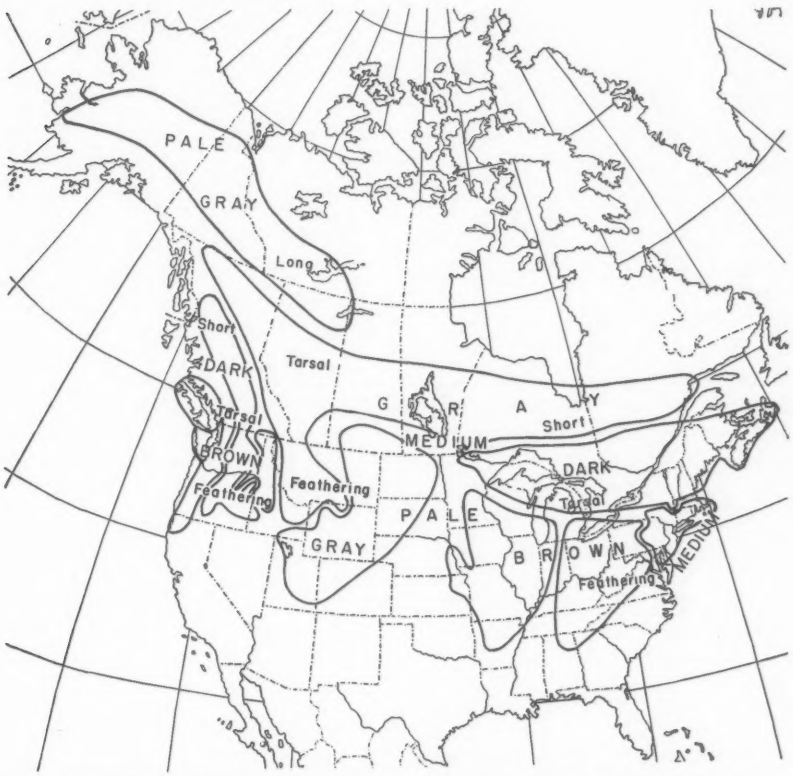

Fig. 26. Distribution of major characters subject to geographical variation in the Ruffed Grouse. The two main color characters, predominantly brown or predominantly gray, modified as dark, medium, and pale, are designated by capitals. Amount of tarsal feathering is indicated in capital and lower case letters; "Short Tarsal Feathering," for example, means a greater proportion of tarsus is unfeathered. Solid lines indicate limits of recognized races.

Unfortunately for previous students of the group, who had to work with material geographically less complete and locally less ample than ours, it so happens that unusually large numbers of specimens from intermediate areas (between the ranges of two or more races) have been collected and have tended to obscure the true characters in an apparently meaningless welter of individual variation. This is especially true of such areas as southern New England, central New York, southern Michigan, the southern portions of the Prairie Provinces and southern British Columbia. With adequate series laid out geographically, these otherwise troublesome specimens quickly assume

their correct place and even substantiate by their intermediacy the validity of the characters of the adjacent forms.

Taking into consideration the very great individual variation over the entire range of the species, several well marked clines or trends in geographic variation are noticeable. Generally speaking brownish hues prevail on the two coasts, while grayish tones replace them in the interior and to the north. Other clines are found in the relative darkness and pallor of the pigmentation and in the proportion of the tarsus covered by feathers. Tarsal feathering reaches its maximum extent in Alaska, and decreases in amount to the southward. The difference is even more pronounced in progressing both to the east and to the west of the Rocky Mountain region. Size is a good criterion in separating the two sexes, the male usually being considerably larger, particularly in tail length. Neither dimensions nor proportions, however, seem to have any significant geographical variation. In fact the average measurements of ruffed grouse throughout the length and breadth of their range are remarkably constant. There are slight geographical trends in average size measurements, but these are probably never significant in distinguishing any race from its nearest neighbor. On the average eastern birds are slightly larger than those from western localities, in wing and tail, but in toe and tarsal measurements the largest are rather conspicuously centered among the dark brown Pacific Coast birds.

ECOLOGICAL SIGNIFICANCE OF VARIATION

One of the most gratifying facts about the geographical variation of ruffed grouse is its obvious correlation with ecological factors. Each of the major biotic communities or biomes of the North American Upper Austral, Transition, Canadian, and Hudsonian life-zones, with the exception of the Grassland Biome, has at least one recognizable race of *Bonasa* which seems to be characteristic of it. (For further discussion of the correlation of bird distribution with biomes the reader is referred to Pitelka, 1941.) In some instances individual races or subspecies are confined to a single association, or region, having the same climax dominants throughout, within the biome. The Ruffed Grouse, probably because of its dependence upon the buds of deciduous trees for winter food, is predominantly a deciduous-forest bird. For this reason it is only within the region of the Deciduous Forest Biome, in the Upper Austral Life-zone of the eastern United States, that this species can be considered as characteristic of the climax community. Even here, however, it is probably more abundant on the borders of the climax forest or in subclimax woodlands. In the Canadian and Transition life-zones of the mountains and the Pacific Coast region of the western part of the continent, where coniferous trees are the climax dominants, the Ruffed Grouse is confined almost entirely to the subclimax communities usually dominated by species of poplar, birch, willow, or alder.

Whereas the northern limit of the distribution of the Ruffed Grouse seems to coincide with the northern limit of biotic communities dominated by vegetation of tree size, the southern limit does not. Deciduous forest growths seemingly suitable for supporting populations of these birds occur south of the range of *Bonasa umbellus*. Some other force, possibly the combined effect of high summer temperatures, atmospheric moisture, and forest cover, is the limiting one here.

Although the life form of dominant vegetation seems to be the chief agent limiting the distribution of the species as a whole, racial variation seems to be correlated to a large extent with atmospheric moisture. For this reason it also appears to be correlated with the distribution of different climax community types, which, in turn, are limited largely by precipitation and humidity. Roughly speaking the greatest intensity of brown coloration is found in the Atlantic and Pacific coastal regions, where rainfall and

humidity are relatively high, particularly in the misty southern Appalachian Mountains and in the fog-drenched coast of Washington. The gray tones on the other hand are most pronounced in the relatively arid Rocky Mountain and Great Plains regions. More northern latitude also seems to produce a graying effect, indicating that temperature as well as moisture may be correlated with color variation. Thus grouse from both Alaska and northern Canada are much more grayish than populations from equally near the coast farther south. Of course the intensity of light in the habitat is an agent which might operate in this case. Indeed this may be the direct force controlling the color variation in all instances. Unfortunately there are few exact data available relative to this factor within the actual habitats in which grouse occur. Still less information, based on controlled experiments concerning the morphological effects of any environmental factor on birds, is available. It would seem to be a stimulating field for experimentation that has been grossly neglected, and that needs the attention of investigators with access to facilities for carrying on extensive breeding experiments with wild birds under controlled environmental conditions. The difficulties are obvious, but the significance of the possible results certainly warrants the attempt.

An attempt is made in the statements of the distribution of races to give the descriptions of ranges in terms of distribution in ecological communities as well as in geographical areas. To avoid confusion as to what is intended by certain controversial ecological terms and concepts the following explanation is offered. Unlike some of his colleagues the senior author thinks that it is possible to bring together the life-zone concept of Merriam and the biome concept of more recent ecologists (see Pitelka, 1941), and to unify the nomenclature, using the older life-zone names where applicable. Thus "biomes" would replace "faunas" as subdivisions of life-zones, and the geographical boundaries of the zones, instead of being based on isotherms, would be delimited by the more fluid boundaries of their component biomes. It should be noted that in the present paper the concept of the Transition Life-zone is somewhat different from that of Merriam and his followers (1910); it includes the ecotones between the northern conifer and subalpine forests on the one hand and the deciduous forests and grassland on the other. The present concept of the Transition Life-zone, therefore, encompasses the various forest climax communities and their respective developmental stages that have been called "Lake Forest," "Pine-Hemlock-Northern Hardwood Forest," and the various "Montane Forests," and the "Aspen Parklands." The *biome* is the largest biotic community possible with a uniform type of life form presented by its primary climax dominant species in response to a certain set of climatic conditions and with some similarities in species composition throughout. The *association* is used here in the broad sense as a subdivision of a biome in which the climax community contains the same species as primary dominants throughout. The various seral or developmental stages (associes) leading up to the climax are characteristic of and are included in the "Assosiation."

KEY TO RACES OF BONASA UMBELLUS

a. General coloration more brownish than grayish.
  b. Dark brown, ventral barring pronounced.
    c. General coloration very dark (chestnut to dark auburn).
      d. General coloration distinctly brownish with little or no grayish cast.
        e. Very reddish, back bright argus brown to dark chestnut, tail auburn to bay.....*B. u. castaneus*
        ee. Duller and less reddish, back between Prout's brown and Dresden brown, tail dull ochraceous umber (brown phase).....*B. u. brunnescens*
      dd. General coloration with more grayish or dusky appearance; tail argus brown to cinnamon brown.....*B. u. phaios* (brown phase)

cc. General coloration lighter (sayal brown to argus brown).
d. Distinctly brownish with little or no grayish cast.
e. Ventral barring darker—cinnamon brown to dark mummy brown ..... *B. u. sabini*
ee. Ventral barring lighter—dusky Isabelline to buckthorn brown ..... *B. u. monticola*
dd. Browns mixed with some gray.
e. Blackish areas of upper parts more pronounced; brown parts darker and less rufescent—cinnamon brown to dark Prout's brown ..... *B. u. togata*
ee. Blackish areas of upper parts less well developed; brown areas paler and more rufescent — mikado brown to snuff brown ..... *B. u. affinis* (brown phase)
bb. Light brown, barring less pronounced.
c. General coloration darker, head and neck with little if any grayish suffusion, tail (brown phase) nearly hazel ..... *B. u. umbellus*
cc. General coloration paler, head and neck with pale grayish suffusion, tail (brown phase) nearly ochraceous tawny ..... *B. u. medianus*
aa. General coloration more grayish than brownish.
b. Definitely gray with little or no brownish wash.
c. Very pale (smoke gray to pale neutral gray).
d. Tarsus unfeathered* for ¼ its length or less; more white in upper parts ..... *B. u. yukonensis*
dd. Tarsus unfeathered* for not less than ½ its length; less white in upper parts ..... *B. u. incanus*
cc. Darker (mouse gray to light grayish olive) ..... *B. u. phaios* (gray phase)
bb. Gray mixed with considerable brown.
c. Tarsus unfeathered* for more than ½ its length ..... *B. u. affinis* (gray phase)
cc. Tarsus unfeathered* for less than ½ its length ..... *B. u. umbelloides*

* Point of insertion of feathers on outside of tarsus to junction of tarsus with middle toe is measurement for unfeathered tarsus.

DESCRIPTIONS OF RACES

Bonasa umbellus umbellus (Linnaeus)

Eastern Ruffed Grouse

Tetrao umbellus Linnaeus (1766:275); based on The Ruffed Heath-cock or Grous, Edwards (1758:248); in Pennsylvania = eastern Pennsylvania.

Bonasa Jobsii Jaycox (1871:182); Ithaca, New York.

Bonasa umbellus helmei H. H. Bailey (1941:1); Miller Place, Long Island, New York.

Adult male (brown phase).—Feathers of forehead, crown, and occiput sayal brown to cinnamon brown, barred with blackish, and tipped with smoke gray to pale smoke gray; elongated crest feathers with blackish extended toward base on outer edges of both webs, leaving brown as a broad basal shaft stripe with lateral branches, the blackish marks very narrowly edged on their distal margins with cinnamon brown; nape sayal brown to cinnamon brown, tipped with smoke gray; interscapulars similarly brownish, but with smoke gray confined to the distal portion of shaft and a large terminal shaft spot, the remaining part of feathers irregularly crossed by blackish marks which fail to connect toward shaft; outermost of these marks often very broad (8-10 mm.); neck ruffs either deep black with slight bluish purplish sheen, dark fuscous black with blue-black tips to feathers, or bright auburn with narrow fuscous tips to feathers; upper back, lower back, and rump cinnamon brown to dark Brussels brown, the feathers of upper back with cordate terminal shaft spots of tilleul buff to vinaceus buff, narrowly edged with black and occasionally sparsely flecked with blackish; feathers of lower back and rump with these spots broader, more oval and with a distally converging "V" of blackish within the light area, the spots separated from the tips of the feathers by 3 to 8 mm. of dark smoke gray; in rump feathers, brown areas faintly and sparsely vermiculated with blackish on concealed basal portions; upper tail coverts cinnamon brown, very broadly tipped with smoke gray (about 15 mm. wide) and crossed by 5 or 6 narrow, equally spaced, wavy fuscous black bands, each of which (except most distal one, which borders on proximal edge of gray terminal area) is followed distally by narrow band (wider than black band) of cinnamon buff to pale tawny olive, which in turn is followed by broken line of fine blackish dots; gray tips finely speckled or vermiculated with black, with large blotch of dark fuscous black, edged with auburn, in their middle portion.

Lesser and median upper wing coverts sayal brown to cinnamon brown, very narrowly and incompletely edged with blackish and with mesial streaks of pale buffy white, narrowly edged with dusky; greater upper secondary coverts similar, but with brown areas faintly vermiculated with blackish; greater upper primary coverts fuscous, externally narrowly edged with cinnamon brown, the edging widest basally; primaries fuscous on inner webs and terminally on outer ones, most of outer webs cartridge buffy to buffy white, with 5 to 7 dusky fuscescent triangular bars, the base of each is against the shaft and its apex is at outer edge of vane, causing whitish areas to appear like reversed triangles; these dusky marks become small and faint or disappear entirely on distal third of feathers; secondaries fuscous, externally broadly edged with sayal brown, coarsely vermiculated with fuscous, and tipped with drab; the innermost secondaries have their inner webs also margined with vermiculated sayal brown with a wash of drab; scapulars like greater secondary coverts, but with light mesial streaks much wider and adjacent part of inner web extensively blackish.

Rectrices cinnamon to clay color, tipped broadly with smoke gray, with fine black vermiculations, subterminally broadly banded with fuscous black to bister, this band sometimes breaking down to a series of vermiculations in median pair of rectrices (possibly in younger adult birds); subterminal dark band edged basally with another smoke gray band similar to terminal one, remainder of feathers crossed by 7 to 9 narrow, wavy fuscous black bands, each followed distally by band of cinnamon buff, which, in turn, is edged distally by broken series of blackish vermiculations that extend in reduced size into the brown interspaces.

Loral stripe pale pinkish buff narrowly edged with blackish spots; lower eyelid a line of pinkish buff and black spots; feathers of cheeks and auriculars elongated, sayal brown, with blackish edges and pale ashy brown shaft streaks; chin whitish washed with buffy or pale ochraceous buff, the feathers sometimes tipped narrowly with black; throat light ochraceous buff, becoming whitish laterally on upper throat, the feathers forming the lateral and posterior portions of gular area tipped with fuscous black, producing a somewhat scalloped pattern; upper breast cinnamon brown to light auburn, each feather broadly tipped with smoke gray, so that in fresh plumage the brown is largely obscured; brown areas of feathers basally largely light pinkish cinnamon with darker cinnamon brown forming incomplete bands, especially subterminally; lower breast and upper and lateral parts of abdomen grayish white to pale smoke gray, subterminally crossed by broad bands of wood brown to buffy brown, narrowly edged on both sides with darker and the feathers washed with buff basally; brownish subterminal bands usually largely hidden by grayish white tips of feathers, especially on abdomen, these bands darker and more exposed on lateral feathers; middle of abdomen with no brown, pure grayish white; feathers of sides sayal brown to Saccardo's umber, slightly vermiculated with blackish and with white shaft streaks that expand distally into broad terminal spots; flanks similar, but brown areas more ashy and more vermiculated, the vermiculations forming narrow bands, the shaft streaks washed with grayish and not expanding into terminal spots; thighs drab to whitish, washed with pale vinaceous buff; under tail coverts clay color to cinnamon buff, broadly tipped with white, the white sometimes extending back in a narrow streak along shaft, the brown parts frequently with a few blackish spots; under wing coverts sayal brown to Saccardo's umber, with whitish mesial streaks; axillars white, banded broadly with sayal brown; iris hazel; bill dark brown; feet dark grayish olive with brownish wash.

Adult male (*gray phase*).—Similar to red phase except that interscapulars, back, lower back, and rump feathers and upper wing coverts have brown areas vermiculated and irregularly banded with smoke gray, the feathers completely margined with the same; in upper tail coverts and rectrices rufescent replaced by smoke gray, which is generally somewhat more abundantly flecked and vermiculated with black than in red phase; subterminal band is usually fuscous to fuscous black, but occasionally dark argus brown (in which examples the ruffs are usually auburn with blackish tips); outer margins of greater upper primary coverts paler—wood brown; sides, flanks, and thighs more ashy, and brown on under tail coverts reduced largely to narrow, incomplete cross bars. In the winter, grouse of both sexes differ from summer birds in the presence of "snowshoes" caused by the growth of the lateral scales on the toes, and also in the more extensive grayish tips and margins to the feathers which wear off by spring, giving a slightly more rufescent appearance to spring and summer specimens.

Adult female (*both phases*).—Similar to corresponding males but averaging smaller, particularly in the tail, and with shorter ruffs, the gray-phase females less pure gray on tail, more mixed or washed with rufescent than in gray males, and pectoral area in both phases more extensively tawny or hazel; cordate spots on feathers of back and rump smaller than in males and also more washed with avellaneous to wood brown.

Immature (*both sexes*).—Similar to adults of corresponding sex and phase, but ruffs slightly duller and slightly smaller; birds in this stage may be recognized however chiefly by the fact that they carry two outer primaries of the juvenal plumage which differ from the adult feathers in that their outer webs are not cartridge buff or whitish, marked with sayal brown, but pale fuscous, mottled and

stippled with pinkish buff to pale cinnamon buff. In the literature one finds statements to the effect that the juvenal primaries, such as are retained in the immature plumage, are light vinaceous cinnamon unmarked except for a very fine sprinkling of a slightly darker shade, but the difference between them and adult primaries is confined to their outer webs.

Juvenile (*sexes alike*).—Similar to adult female but browner above, more abundantly marked with sayal brown to Saccardo's umber on underparts, but these marks more irregularly disposed, not so clearly forming bars, but something between bars and heavy transverse mottling; tail feathers lacking heavy black subterminal band and smoke gray tips poorly developed; narrow blackish rectricial bands (about as in the adults in number) each followed distally by a band of pale sayal brown or cinnamon, lighter than rest of the feather, or by a band of pale smoke gray (possibly birds that would become gray-phased later on); head very different from adult—forehead, crown, and occiput snuff brown to Saccardo's umber, spotted with fuscous black; buffy whitish line extends from loreal antiæ through both eyelids to sides of occiput; cheeks and auriculars snuff brown to Saccardo's umber, the former spotted with dusky sepia to fuscous black; chin and most of upper throat whitish, unmarked; feathers of back and rump and upper tail coverts different from those of adult—ashy sayal brown narrowly barred with sepia to fuscous; iris hazel brown; bill "brown and slate"; feet bluish white.

Downy young.—Forehead, crown, occiput, and nape pale ochraceous tawny, darkening medially and posteriorly to tawny, and paling laterally to light ochraceous buff on sides of crown and occiput, and on lores, cheeks, and auriculars; middorsal area from nape to tail bright russet, this area widening very considerably on lower back, the body down on either side of this ochraceous buff, becoming lighter ventrally; entire underparts ivory yellow to light cream buff, a fuscous black line extending from posterior end of eye to posterolateral angle of occiput; upper surface of wings pale russet, under surface cream buff.

Measurements (extremes and averages in millimeters): *Adult male.*—Wing, 174-190 (183.6); tail, 144-174 (159.0); culmen from base, 25.8-29.0 (27.0); tarsus, 41.9-47.9 (43.9); middle toe without claw, 32.4-39.0 (36.7); unfeathered part of tarsus, 21.7-31.1 (26.3); 20 specimens from Massachusetts, Rhode Island, eastern Pennsylvania, and southeastern New York. *Adult female.*—Wing, 170-188 (176.4); tail, 123-141 (132.6); culmen from base, 23.8-28.1 (26.3); tarsus, 39.6-43.6 (41.2); middle toe without claw, 32.7-36.9 (34.2); unfeathered part of tarsus, 20.2-30.0 (24.9); 16 specimens from Massachusetts, southeastern New York, and District of Columbia.

Distribution.—Climax and subclimax deciduous woodland of the Atlantic coastal White Oak-Pitch Pine Association and the northeastern portion of the Red Oak-Beech-Tulip Association in the Eastern Deciduous Forest Biome, Upper Austral and Lower Transition life-zones; extends north to central eastern and central Massachusetts, east-central and central New York, west to central New York and east-central Pennsylvania and south to Cape May, New Jersey, and, formerly, to Washington, D. C.

There is abundant evidence in the specimens at hand to show that *Bonasa umbellus monticola* ranges up through middle Pennsylvania to the northeastern part of that state. For this reason it would seem essential to restrict the type locality of *Bonasa umbellus umbellus*, which has always been given as merely "eastern Pennsylvania," to the vicinity of Philadelphia, in the southeastern part of the state. A specimen in the Academy of Natural Sciences of Philadelphia, from near-by Bryn Mawr, is typical of the paler bird that we are considering as *umbellus*. The Eastern Ruffed Grouse intergrades with *monticola* in south central New York, east central Pennsylvania, central Maryland, and northeastern Virginia. Specimens from the vicinity of Ithaca, New York, are somewhat intermediate toward *monticola*, but are nearer *umbellus*, thus making *jobsii* Jaycox a synonym of *umbellus*. Specimens from Long Island, New York, are intermediate between *umbellus* and *togata*, but like specimens from southern New England they average nearer *umbellus*, of which race *helmei* H. H. Bailey therefore becomes a synonym.

Bonasa umbellus medianus Todd

Midwestern Ruffed Grouse

Bonasa umbellus medianus Todd (1940:394); Excelsior, Minnesota. (?) *Bonasa ceres* Shufeldt (1913:300); Pleistocene of fissure beds of Arkansas). This name is proposed as either a *Bonasa* or a *Lagopus*; a critical study of the bones on which it is based is yet to be made. Even if it were proved to be definitely *Bonasa umbellus*, the name would not be available for the present subspecies, as there is no proof that the grouse of the Pleistocene and of the present day are subspecifically identical.

Adult.—Closely similar to the corresponding sexes and phases of *Bonasa umbellus umbellus*, but very slightly paler, the top and sides of head and neck with a pale grayish suffusion; on the average, breast less extensively washed with brownish, abdomen more albescent, and, in brown phase, tail paler, nearly ochraceous tawny (in brown phase of *umbellus* it is nearly hazel).

Juvenile.—No specimens seen.

Downy young.—No specimens seen.

Measurements: *Adult male.*—Wing, 174-185 (178.9); tail, 140-163 (150.6); culmen from base, 25.2-30.6 (27.8); tarsus, 41.8-45.8 (43.5); middle toe without claw, 34.5-39.5 (36.8); unfeathered part of tarsus, 18.4-30.2 (23.8); 19 specimens from southern Minnesota, Wisconsin, southwestern Michigan, and Iowa. *Adult female.*—Wing, 171-183 (176.6); tail, 127-159 (141.3); culmen from base, 26.0-28.2 (27.3); tarsus, 40.8-44.8 (42.7); middle toe without claw, 34.5-37.4 (35.4); unfeathered part of tarsus, 21.6-30.0 (25.4); 3 specimens from southern Minnesota and Illinois.

Distribution.—Climax and subclimax deciduous woodland of the White Oak-Shagbark Hickory Association in the Eastern Deciduous Forest Biome, Upper Austral Life-zone; ranges from southwestern Michigan, southern Wisconsin, and east-central Minnesota (Elk River), south, east of the Great Plains grassland, to central Arkansas (Hot Springs). To the east *Bonasa umbellus medianus*

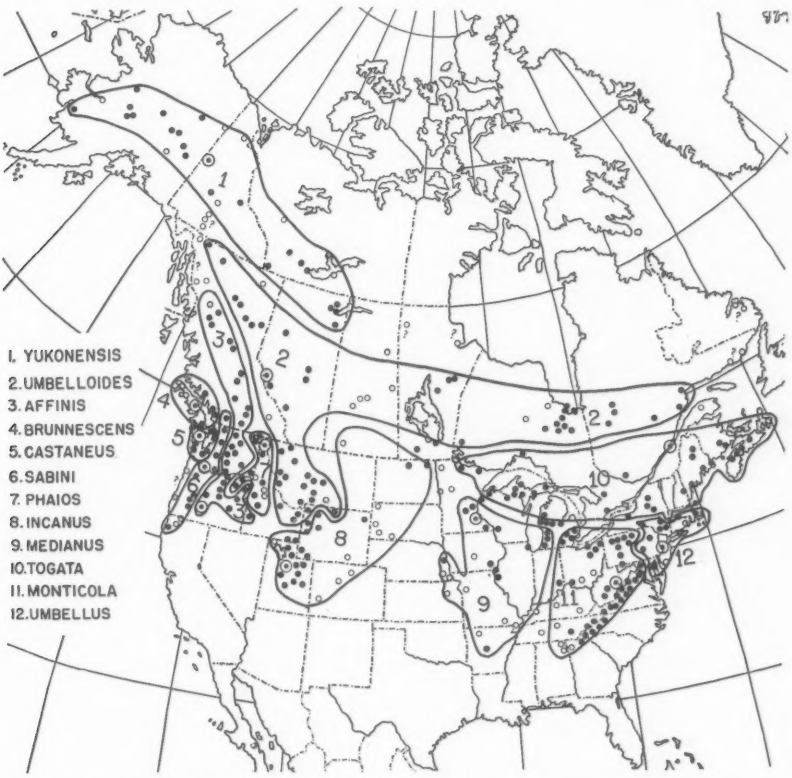

Fig. 27. Distribution of the races of the Ruffed Grouse (*Bonasa umbellus*). Solid black spots indicate localities from which one or more specimens have been examined by the authors. Open circles mark localities from which ruffed grouse have been recorded but from which no specimens have been examined by the authors. Type localities are shown by encircled dots.

Note.—The boundary lines on this map are designed to show the limits of racial characters which should not be confused with the limits of occurrence of ruffed grouse. There are large areas included within the boundaries of some races where no ruffed grouse occur at all, or, if they do, only in relatively small isolated islands of favorable habitat. This is particularly true of the regions in which forest communities intergrade with tundra or grassland.

intergrades with *Bonasa umbellus monticola* over a broad area in southern Michigan, Indiana, and probably formerly in western Kentucky and Tennessee.

Note.—If this race were not separated geographically from *Bonasa umbellus umbellus* by *Bonasa umbellus monticola*, its recognition might be questioned. There seems to us to be less difference between *medianus* and *umbellus* than between any other two subspecies of ruffed grouse herein recognized as distinct.

Bonasa umbellus monticola Todd

Appalachian Ruffed Grouse

Bonasa umbellus monticola Todd (1940:392); 2½ miles east of Cheat Bridge, Randolph County, West Virginia, 4,000 feet elevation.

Adult (brown phase).—Similar to that of *Bonasa umbellus umbellus*, but general coloration darker, under parts more regularly and more heavily barred and more strongly suffused with buffy; upper parts more brownish, less rufescent—Prout's brown instead of cinnamon brown as in *umbellus*; ventral bars become dark (dark sepia to clove brown) on flanks.

Adult (gray phase).—Similar to that of *Bonasa umbellus umbellus*, but upper and lower back darker, more brownish, the tail apparently never so pure gray, but always with at least a slight tinge of rufous; ventral bars darker, as in brown phase, but under parts less washed with buff. This plumage is very much like that of the brown phase of *togata*.

Juvenile.—There seem to be two phases in juveniles, both, as far as available material shows, possess brown tails, but one is much grayer above than the other. In the browner of the two phases, juveniles are like *Bonasa umbellus umbellus*, but darker, browner, less rufescent above, the blackish marks on the upper parts larger and the ventral barrings darker as in the adult. In the grayer of the two phases the areas of the nape, interscapulars, upper wing coverts, back, rump, and upper tail coverts that are Dresden brown to Saccardo's umber in the brown phase are wood brown, the pale areas of the interscapulars are pinkish buff (as opposed to cinnamon buff to pale clay color in the browner phase), and the ventral barrings are darker and less rufescent—buffy brown to sepia.

Downy young.—Similar to that of *Bonasa umbellus umbellus* but darker and more brownish, less vinaceous.

Measurements: *Adult male.*—Wing, 172-196 (186.8); tail, 139-181 (160); culmen from base, 24.4-31 (27.4); tarsus, 40-48.2 (44.5); middle toe without claw, 32.8-40 (36.5); unfeathered part of tarsus, 21.4-34.5 (28.5); 39 specimens from Virginia, West Virginia, North Carolina, Georgia, Maryland, western Pennsylvania, Tennessee, Ohio, and southeastern Michigan. *Adult female.*—Wing, 166-190 (178.6); tail, 121-156 (134.8); culmen from base, 23.8-29.3 (26.6); tarsus, 37.4-45 (41.1); middle toe without claw, 32.2-39.6 (35.1); unfeathered part of tarsus, 19.4-33.6 (27.2); 35 specimens from Virginia, West Virginia, North Carolina, Georgia, Tennessee, western Pennsylvania, Maryland, Ohio, and southeastern Michigan.

Distribution.—Climax and subclimax deciduous forest communities of the Red Oak-Beech-Tulip Association in the Eastern Deciduous Forest Biome, Upper Austral Life-zone, and both the Montane and Subalpine forests (Eastern Hemlock-Yellow Birch, and Red Spruce-Fraser Fir associations of the Transition and Canadian life-zones, respectively) in the Appalachian Mountains; ranges north to northeastern Pennsylvania, northeastern Ohio, and southeastern Michigan; east to northeastern and south-central Pennsylvania, central Maryland, northeastern, central, and southwestern Virginia, southwestern North Carolina and northern Georgia; and south to northern Georgia and northeastern Alabama. The western limit of the range of this race is ill-defined because of the fact that the species has been extirpated over much of the Mississippi Valley region where it formerly occurred. *Bonasa umbellus monticola* intergrades with *medianus* in central southern Michigan, Indiana, and probably also formerly in western Kentucky and Tennessee. The height of expression of its characters is found among specimens from the mountains of the southern part of the Appalachian Range.

Bonasa umbellus sabini (Douglas)

Pacific Ruffed Grouse

Tetrao Sabini Douglas (1829:137); Coast of Northwest America, between the 40° and 49° parallels, from Cape Mendocino to Vancouver's Island; restricted type locality—the vicinity of Fort Vancouver, Clarke County, Washington, according to Hall (1934:10).

? *Tetrao Fusca* Ord (*in* Guthrie, 1815:317); based on Small Brown Pheasant (Lewis and Clark, 1814:182). This name is considered as not certainly identifiable. Coues (1874:394) relegates it, with a query, to the synonymy of *Canachites franklini*, although in his later "History of the Exped. under . . . Lewis and Clark" (3, 1893:872), he definitely identifies it as *Bonasa umbellus fuscus*, "the variety of the ruffed grouse commonly called *Bonasa umbellus sabinei*. . . ." (largely because of the mention of

the fact that the breast meat is white). Even if Coues's later action were to be followed we would be unable to place the name because of the absence of a sufficiently circumscribed locality and the possibility of its applying equally well to *sabini* or *affinis*.

Adult (brown phase).—Similar to that of *Bonasa umbellus umbellus*, but much more darkly and richly colored (darker and richer than *Bonasa umbellus monticola* also, although closer in appearance to that race than to any other); black markings above more extensive and conspicuous; areas which are sayal brown to cinnamon brown in *umbellus* are orange cinnamon, cinnamon rufous, or hazel, those that are cinnamon brown to dark Brussels brown in *umbellus* are bright dark amber brown to rufescent argus brown; rectrices bright amber brown; ventral barrings darker—dark Dresden brown, narrowly edged with fuscous, the lateral bars on sides and flanks darker still—mummy brown to clove brown; thighs darker—wood brown to avellaneous, tinged with cinnamon buff. There are two varieties of this phase agreeing in all respects, except the color of the breast; in one variety this area is blackish, the feathers narrowly tipped with whitish or tawny, whereas in the other there is no black, but the feathers are bright tawny, becoming mummy brown only basally.

Adult (gray phase).—Similar to brown phase, but with feathers of crown, occiput, and nape, tipped with smoke gray; those of upper and lower back, and rump, and upper tail coverts terminally edged with pale neutral gray, vermiculated with blackish; rectrices as in gray phase of *Bonasa umbellus umbellus*, but darker, more washed with wood brown.

Juvenile.—None seen.

Downy young.—Darker and more brownish than that of *umbellus*. Indistinguishable from *monticola*.

Measurements: Adult male.—Wing, 177-187 (182); tail, 142-159 (151.7); culmen from base, 25.8-28.1 (26.5); tarsus, 43.0-45.1 (44.1); middle toe without claw, 39.0-41.9 (40.1); unfeathered part of tarsus, 16-28.6 (22.8); 6 specimens from Washington and Oregon. *Adult female.*—Wing, 170-181 (174.3); tail, 124-137 (130.2); culmen from base, 24.9-28.4 (26.4); tarsus, 41.2-44.2 (43.0); middle toe without claw, 33-39 (36.5); unfeathered part of tarsus, 17.8-28.0 (22.3); 6 specimens from Washington, Oregon, and California.

Distribution.—Subclimax deciduous woodlands (alder, maple, and willow communities) of the Western Red Cedar-Western Hemlock Association in the Pacific Moist Forest Biome, Transition Life-zone; from southwestern British Columbia, exclusive of Vancouver Island and the immediate vicinity of the coast, southward west of the Cascade Range, through Washington and Oregon, exclusive of the Olympic Peninsula and the immediate vicinity of Puget Sound, to northwestern California (Humboldt Bay and Salmon River).

Bonasa umbellus castaneus new subspecies

Olympic Ruffed Grouse

Type.—No. 157949, United States National Museum (Biol. Surv. Coll.); adult male (brown phase); Soleduck River, elevation 1,200 feet, Olympic Mountains, Washington; collected August 29, 1897, by Vernon Bailey; original number 439.

Adult (brown phase).—Darkest and most richly colored of all the predominantly brown races of the species, being even darker than *sabini* and more reddish than *brunnescens*; brown of upper parts deep chestnut to dark auburn with no grayish mixture; ventral barrings Dresden brown to raw umber, darkening to mummy brown on sides and flanks, the chin, throat, breast, and upper abdomen, sides, flanks, and under tail coverts heavily washed with ochraceous buff; ruff black or rufescent, black being the commoner of the two.

Adult (gray phase).—None seen.

Juvenile.—None seen.

Downy young.—Darker and more reddish and less buffy than in *Bonasa umbellus umbellus*.

Measurements: Adult male.—Wing, 176-187 (182.8); tail, 145-168 (153.9); culmen from base, 25.6-29.9 (27.8); tarsus, 43.6-48.0 (45.3); middle toe without claw, 38.9-42.2 (40.7); unfeathered part of tarsus, 16.0-29.4 (23.5); 11 specimens from the Olympic Peninsula and the Puget Sound region. *Adult female.*—Wing, 170-178 (174.9); tail, 130-139 (131.8); culmen from base, 23.6-28.0 (26.5); tarsus, 41.2-45.5 (44.0); middle toe without claw, 37.0-39.7 (38.6); unfeathered part of tarsus, 20.8-29 (24.6); 9 specimens from the Olympic Peninsula and the Puget Sound region.

Distribution.—Subclimax deciduous woodland (alder and willow communities) in the very wet portion of the Western Red Cedar-Western Hemlock Association, in the Pacific Moist Forest Biome, Transition Life-zone; Olympic Peninsula, and the immediate vicinity of the shores of Puget Sound in western Washington; ranges south to Fort Steilacoom, Cedarville, and Shoalwater Bay, possibly also farther south along the "fog forest" belt in Oregon, although no specimens have been seen from the coast south of the Columbia River to establish this as a fact.

Bonasa umbellus brunnescens Conover

Vancouver Island Ruffed Grouse

Bonasa umbellus brunnescens Conover (1935:204); Comox, Comox District, Vancouver Island, British Columbia.

Adult (brown phase).—Similar to that of *Bonasa umbellus umbellus*, but darker, more brownish, less rufescent; also darker, more brownish, than *sabini* and more brownish, less reddish, than *castaneus*; general color of upper parts between Prout's brown and Dresden brown, tail dull ochraceous umber; under parts heavily barred with grayish ochraceous umber and washed extensively with tawny buff.

Adult (gray phase).—Similar to brown phase but top of head, neck, back, rump, and upper tail coverts mixed and vermiculated with dark smoke gray; rectrices dark smoke gray, barred and vermiculated with black and without any brownish tinge (the heavy black wavy bars are usually single in this race in both phases, whereas in *sabini* and *castaneus* they are double with a pale ochraceous band in between them); under parts as in brown phase, but much less washed with buffy.

Juvenile.—Similar to that of *Bonasa umbellus umbellus*, but very much darker brown, with more blackish; also darker than juvenal *togata* and *monticola*; above cinnamon brown to Prout's brown, as opposed to sayal brown in *B. u. umbellus*; ventral barrings darker—dusky Dresden brown.

Downy young.—None seen.

Measurements: *Adult male.*—Wing, 179-189 (183.7); tail, 144-157 (148.6); culmen from base, 26.6-28.3 (27.6); tarsus, 44.0-46.8 (45.6); middle toe without claw, 40-41 (40.3); unfeathered part of tarsus, 24.7-29 (26.7); 6 specimens, including the type, from Vancouver Island, British Columbia. *Adult female.*—Wing, 173-181 (176.3); tail, 124-134 (128.4); culmen from base, 24.4-27.4 (26); tarsus, 41.8-45.2 (43.0); middle toe without claw, 37-39.9 (38.4); unfeathered part of tarsus, 20.5-28 (25.3); 6 specimens from Vancouver Island, British Columbia.

Distribution.—Subclimax woodland (alder, willow, and maple communities) of the Western Red Cedar-Western Hemlock Association in the Pacific Moist Forest Biome, Transition Life-zone; Vancouver Island, British Columbia, and the adjoining mainland from the vicinity of the city of Vancouver, British Columbia, north at least to Malaspina Inlet near Lund. There are no records for ruffed grouse on the coast of British Columbia between this locality and Port Simpson, near the Alaska line; it is doubtful if *brunnescens* ranges much farther north than the immediate vicinity of Vancouver Island.

Bonasa umbellus togata (Linnaeus)

St. Lawrence Ruffed Grouse

Tetrao togatus Linnaeus (1766:275); based on La grosse Gelinote de Canada, *Bonasa major Canadensis* Brisson (1760:207); in Canada = city of Quebec (*apud* Todd, 1940:391).

Bonasa umbellus thayeri Bangs (1912:378); Digby, Nova Scotia.

Adult (brown phase).—Similar to that of *Bonasa umbellus umbellus* but darker brown, less rufescent, above, the areas that are sayal brown to cinnamon brown in *umbellus* being Dresden brown to Prout's brown in *togata*, the parts that are Brussels brown in *B. u. umbellus* being similar but washed with raw umber; upper parts generally with a little more mixture of grayish and with blackish marks more extensive, the underparts similar but more heavily barred than in *umbellus*. In *B. u. umbellus* the brown phase is more frequent than the gray; in *Bonasa umbellus togata* the opposite is true.

Adult (gray phase).—Similar to that of *Bonasa umbellus umbellus* but darker, both in browns and grays of upper parts, the brown as in the brown phase of *togata*—Dresden brown to Prout's brown; blackish markings more extensive, the gray areas, including the tail, smoke gray, much more finely and abundantly vermiculated with blackish than in *umbellus*; underparts more heavily and abundantly barred than in *umbellus*.

Juvenile.—Darker and more grayish than that of *Bonasa umbellus umbellus*.

Downy young.—Darker and more grayish and less buffy than in *Bonasa umbellus umbellus*.

Measurements: *Adult male.*—Wing, 173-192 (181.5); tail, 142-174 (156.9); culmen from base, 22.8-29.2 (26.1); tarsus, 40.3-46.0 (42.7); middle toe without claw, 33.0-39.9 (35.9); unfeathered part of tarsus, 20.0-30.9 (25.2); 32 specimens from Ontario, Nova Scotia, New Brunswick, Maine, New Hampshire, northern Massachusetts, northern New York, northern Michigan, northern Wisconsin, and northern Minnesota. *Adult female.*—Wing, 168-184 (176.0); tail, 119-144 (130.6); culmen from base, 21.0-29.3 (25.2); tarsus, 36.8-44.0 (41.4); middle toe without claw, 31.3-36.7 (34.6); unfeathered part of tarsus, 20.0-28.0 (23.8); 21 specimens from Ontario, Quebec, Nova Scotia, New Brunswick, Maine, New Hampshire, northern New York, northern Michigan, and northern Wisconsin.

Distribution.—Subclimax deciduous woodland (birch and aspen communities) of the White Pine-Hemlock-Sugar Maple Association, which forms the ecotone between the Northern Conifer and the

Eastern Deciduous Forest biomes in the lower Canadian and upper Transition life-zones; ranges from northern New England and Nova Scotia (probably north to Cape Breton Island and the Gaspe Peninsula), westward across southern Quebec and southern Ontario (including the north shore of Lake Superior) to central northern Minnesota, south to northeastern Massachusetts (Manchester), east-central New York (Piseco), southeastern Ontario (Toronto), midway down the Lower Peninsula of Michigan (Midland County) and northern Wisconsin (Ashland County).

Specimens from Nova Scotia average slightly darker and more richly colored than typical *togata*, but the difference is so slight and the overlap is so great that it is not considered on the same plane with that which distinguishes other recognized races of ruffed grouse. Therefore *thayeri* Bangs may best be treated as a synonym of *togata*.

Bonasa umbellus affinis new subspecies

Columbian Ruffed Grouse

Type.—No. 95021 United States National Museum; adult male (gray phase); Fort Klamath, Oregon; collected October 28, 1882, by Captain Charles Bendire; original number 254.

Adult (gray phase).—Similar to the corresponding phase of *Bonasa umbellus umbellus* but darker more brownish above, more heavily barred below (in its general appearance intermediate between the gray phase of *umbellus* and that of *sabini*); feathers of top of head more solidly blackish, edged with smoke gray, and basally pale ochraceous tawny on their hidden portions; interscapulars and inner upper wing coverts cinnamon brown with large blotches and some vermiculations of fuscous to black, and with pale shaft streaks of tilleul buff to pale smoke gray; feathers of upper back similar but with less blackish, more mottled with smoke gray on their terminal portions; feathers of lower back, and rump, and upper tail coverts Prout's brown, sparingly vermiculated with black, with broad, tear-shaped whitish shaft spots which are longitudinally streaked and edged narrowly with black, the feathers edged with smoke gray, the extent of the terminal gray increasing on upper tail coverts; rectrices darker gray than in *B. u. umbellus*—smoke gray to light grayish olive with faint ochraceous tinge, especially along shaft and on proximal edge of each of the black wavy bands; rectrices slightly more heavily vermiculated with black; below more heavily barred, the bars dusky Isabelline to tawny olive, darkening on sides and flanks to sepia and mummy brown; lower throat and upper breast more strongly washed with ochraceous tawny than in *umbellus* of same phase. The gray phase is commoner than the brown.

Adult (brown phase).—Similar to gray phase but tail sayal brown with cinnamon wash, instead of smoke gray, the upper parts of head and body and upper wing coverts browner, less grayish, more rufescent, but not as rufescent as the brown phase of *sabini*; pale shaft streaks of the interscapulars pale ochraceous tawny, the upper back and lateral brown areas of interscapulars Dresden brown to mikado brown, vermiculated with blackish; lower back and rump dark mikado brown to rufescent Prout's brown; ventral barrings darker than in gray phase—Dresden brown darkening on the sides and flanks to mummy brown. This phase is closest to the brown phase of *togata*, but has the black markings less extensive.

Juvenile.—Similar to that of *Bonasa umbellus umbellus* but very slightly more rufescent (more than in *monticola* also) above and with the ventral bars darker—sepia to mummy brown; rectrices and outer webs of secondaries bright ochraceous tawny.

Downy young.—None seen.

Measurements: *Adult male*.—Wing, 171-191 (181.7); tail, 130-170 (152.4); culmen from base, 23.4-28.8 (26.3); tarsus, 40.4-45.5 (42.9); middle toe without claw, 34.2-41.0 (37.6); unfeathered part of tarsus, 14.5-29.2 (21.6); 42 specimens from British Columbia, Washington, and Oregon. *Adult female*.—Wing, 170-185 (176.2); tail, 123-157 (132.4); culmen from base, 23.9-28.4 (26.2); tarsus, 36.0-42.2 (40.6); middle toe without claw, 32.5-39.3 (35.2); unfeathered part of tarsus, 14.0-25.0 (19.4); 16 specimens from British Columbia, Washington, Oregon, and Idaho.

This race, which has been identified by numerous authors as the far separated *togata*, probably is a composite subspecies comprising two or three distinguishable ecological races inhabiting areas of their respective habitats in scattered mountain regions. The range of variation within the populations included in *affinis* is greater than in any other subspecies. It includes very pale gray individuals similar to Utah birds, medium brownish gray examples similar to *umbelloides*, as well as the darker, more brownish, types considered as typical of the present subspecies. Certainly the ecological conditions embraced within the range of *affinis* are more diverse than those encountered by any other subspecies. However, the correlation of these character differences with the habitat differences is too poorly understood at present to distinguish them nomenclaturally. A more thorough study of the problem in the field, however, might show such recognition to be desirable on the basis of ecological segregation of the type mentioned by Miller (1942:34) in certain species of the San Francisco Bay region.

Distribution.—Subclimax deciduous woodlands (alder, aspen, poplar, birch, and willow communities) of the montane and lower subalpine forests in the Transition and Canadian life-zones; ranges from Fort Klamath and Harney, Oregon, northward east of the Cascades (excluding the mountains of northeastern Oregon, southeastern and northeastern Washington), through the interior of British Columbia, to Hazelton. Specimens from Bear Lake in north-central British Columbia and from Telegraph Creek farther to the northwest in the same province had best be considered as intermediate between *affinis* and *umbelloides*.

The range of *Bonasa umbellus affinis*, as here delineated, includes populations of much paler and more grayish birds (possibly representing a distinct "ecological race") from the more arid interior regions of Washington and Oregon. The extreme examples of this type are found among specimens from Tunk Mountain, Aeneas, Twisp, Mazama, Molson, and Oroville, in Okanogan County, and Swan Lake and Curlew in Ferry County, Washington.

Bonasa umbellus phaios new subspecies

Idaho Ruffed Grouse

Type.—No. 158052 United States National Museum (Biol. Surv. Coll.); adult male (gray phase); Priest River, Idaho; collected October 9, 1897, by R. T. Young; original number 324.

Adult (gray phase).—Similar to that of *Bonasa umbellus umbellus* but less brownish, more grayish, and much darker, the smoke gray of upper parts of latter being replaced by mouse gray to light grayish olive, abundantly and heavily vermiculated with black; general dorsal coloration more grayish than brownish, only interscapulars and upper surface of wings being brownish—Saccardo's umber to dusky olive brown and dull sepia (even the interscapulars largely grayish terminally); lower back and rump feathers basally and laterally sepia, but this color less extensive than vermiculated gray parts of feathers; below more heavily barred than *umbellus* (more like *affinis* and *togata*), the bars pale Saccardo's umber to mummy brown, the throat and breast strongly tinged with pale ochraceous tawny.

Adult (brown phase).—Similar to that of *Bonasa umbellus umbellus* but much darker, less rufescent, more brownish (more like corresponding phase of *brunnescens*, but with more grayish or dusky); tail Dresden brown tinged, especially laterally, with ochraceous tawny, the brown of upper parts of head, body, and wings dark, dull Saccardo's umber to dark Dresden brown, vermiculated with black, the feathers of the upper and lower back with a dark grayish mixture; feathers of rump darkened to Prout's brown, medially tipped with dark smoke gray to pale grayish olive; below similar to gray phase but slightly less buffy on breast.

Juvenile (male only seen).—Above much grayer than in *Bonasa umbellus umbellus*, the general coloration of upper parts of head, body, wings, and tail drab to ashy hair brown, the interscapulars, scapulars, and a few of feathers of back having ashy tilleul buff shaft stripes and cross bars with incomplete broad clove brown to blackish interspaces; outer margin of secondaries buffy avellaneous, lesser upper wing coverts with light brownish olive tinge; crown and occiput dark mouse gray, the feathers with broad black terminal areas, margined and narrowly tipped with dark mouse gray; hind neck, sides of neck and breast washed with ochraceous tawny; ventral barring mummy brown.

Downy young.—None seen.

Measurements: *Adult male.*—Wing, 175-193 (182.7); tail, 141-171 (157.7); culmen from base, 24.8-28.6 (26.6); tarsus, 39.8-46.0 (42.7); middle toe without claw, 34.8-39.7 (37.6); unfeathered part of tarsus, 15.7-28.8 (23.2); 34 specimens from Washington, Oregon, and Idaho. *Adult female.*—Wing, 173-182 (178.6); tail, 124-134 (130.2); culmen from base, 23.5-27.0 (25.2); tarsus, 39.6-43.4 (41.1); middle toe without claw, 34.4-37.5 (36.2); unfeathered part of tarsus, 20.9-27.0 (23.8); 10 specimens from Washington and Idaho.

Distribution.—Subclimax deciduous woodlands (aspen and willow communities) of the Idahoan Montane Forest (Western Larch-Western White Pine Association), Transition Zone; west slopes of Rocky Mountains in Idaho, west to southeastern and northeastern washington and to northeastern Oregon, in the Blue Mountains. Possibly it extends farther north into southeastern British Columbia, but no specimens have been seen to establish this fact. Specimens from the Boise National Forest in southwest central Idaho are intermediate between *phaios* and *incanus*, but somewhat nearer the former. Intergradation with *affinis* in Washington and Oregon is confused by the great individual variation or possibly ecological subspeciation of the populations of grouse in that area.

The distinctness of this race from *umbelloides* has long been recognized by collectors and field observers in Idaho, who have usually expressed their awareness by referring the birds to the far distant *togata*.

Bonasa umbellus umbelloides (Douglas)

Gray Ruffed Grouse

Tetrao Umbelloides Douglas. (1829:148), Valley of Rocky Mountains, lat. 54° N., and near source of Columbia east of the Coast and Cascade ranges; restricted type locality—Henry House, Alberta (Todd, 1940:394).

Bonasa umbellus canescens Todd [not "*Bonasa canescens* Sparrm." Menzbier, Vog. Russl., 1, 1895, 480 (see Hartert, 1921:1887)] (1940:395); Abitibi River, lat. 50° 53′ N., northern Ontario.

Adult (gray phase).—Similar to corresponding phase of *Bonasa umbellus umbellus* but much less brownish, more grayish and darker, being closest in appearance to gray phase of *phaios* from which it differs in being paler gray (brown areas paler also) above, less heavily barred below; tarsus feathering more extensive. Gray of feathers of nape, back, and rump, and upper tail coverts and tail smoke gray, lightly vermiculated with fuscous to blackish; brown areas of interscapulars cinnamon brown to russet, heavily blotched with black; brown of upper surface of wings dull Saccardo's umber, speckled and washed with grayish; below more heavily banded than in *umbellus*, less so than in *phaios*, the brown bands averaging slightly darker than in *umbellus*—pale tawny olive, darkening on the sides and flanks to sepia; tarsus feathered for more than half its length.

Adult (brown phase).—Similar to gray phase but tail tawny olive instead of gray and interscapulars and upper surface of wings slightly more extensively brownish; breast and upper abdomen more washed with tawny buff on the average.

Juvenile (brown phase).—Similar to corresponding plumage of *B. u. umbellus*, but less rufescent, more grayish, the general color of upper parts of head, body, and wings buffy brown to grayish olive brown, the rectrices between wood brown and drab; ventral barrings darker—grayish buffy brown.

Juvenile (gray phase).—Like brown phase but gray, the ground color of upper parts of body and wings and tail grayish drab to ashy hair brown; ventral barrings darker—mummy brown, the under parts less washed with buffy.

Downy young.—Not distinguishable from that of *B. u. umbellus*.

Measurements: *Adult male.*—Wing, 171-195 (182.6); tail, 144-174 (157.7); culmen from base, 24.4-29.4 (26.3); tarsus, 39.0-45.5 (42.5); middle toe without claw, 35.0-40.6 (37.5); unfeathered part of tarsus, 10.9-24.0 (17.7); 43 specimens from Alberta, northern British Columbia, and Montana. *Adult female.*—Wing, 169-180 (174.6); tail, 125-134 (130.4); culmen from base, 23.6-27.6 (25.6); tarsus, 37.5-43.2 (41.0); middle toe without claw, 33.8-36.3 (34.9); unfeathered part of tarsus, 10.9-17.8 (15.3); 11 specimens from Alberta, British Columbia, and Montana.

Distribution.—Subclimax deciduous woodland (aspen, poplar, and willow communities) of the Rocky Mountain Subalpine Forest (Engelmann Spruce-Alpine Fir Association) and the Northern Coniferous Forest (White Spruce-Balsam Fir Association) in the Canadian Life-zone; ranges from northwestern British Columbia (Atlin) southward along the east slopes of the Rocky Mountains to central eastern Idaho and northwestern Wyoming; extends eastward through the aspen parkland and spruce-fir forest of the prairie provinces of Canada, north to middle Manitoba (Oxford House) and south to southwestern Ontario (Lake of the Woods), across Ontario between Lake Superior and James Bay and across Quebec to the north shore of the Gulf of St. Lawrence. (A fine series of specimens from Ontario and Quebec were loaned to us for study by Mr. W. E. C. Todd of the Carnegie Museum, but at Mr. Todd's request the exact localities are omitted here, as they are all to be reported in his work on the birds of the Labrador Peninsula.)

Although specimens from northern Ontario and middle Quebec average slightly darker and have a greater proportion of the tarsus unfeathered than typical *umbelloides* from the east slopes of the Canadian Rockies, the difference seems to be too slight to recognize as a distinct subspecies. These characters merely indicate the trend toward intergradation between *umbelloides* and *togata*. However, the northern Ontario birds are much nearer to *umbelloides* than to *togata*. Therefore *canescens* Todd becomes a synonym of *umbelloides*. Ruffed grouse recorded farther east in Quebec (Anticosti Island, Natashquan and Wolf Bay) and in southeastern Labrador (Hamilton Inlet and Sandwich Bay) may belong to this race also, but no specimens from these regions have been examined in the present study.

Specimens from southern Manitoba (Shoal Lake and Carberry) are intermediate between *umbelloides*, *incanus*, and *medianus*, but on average characters, particularly relatively short unfeathered tarsus, they seem a little closer to *umbelloides*.

Bonasa umbellus incanus new subspecies

Hoary Ruffed Grouse

Type.—No. 155869 United States National Museum (Biol. Surv. Coll.); adult male (brown phase); Barclay, 15 miles east of Salt Lake City, Utah; collected May 1, 1897, by E. A. Preble; original number 253.

Adult (*brown phase*).—A very ashy bird, similar not to brown but to gray phase of *B. u. umbellus*, but paler and, except for tail, less brownish, more like that of *Bonasa umbellus umbelloides* but paler and less brownish on interscapulars, back, and upper surface of wings; general coloration of forehead, crown, occiput, nape, upper back, and upper wing coverts, light neutral gray, tinged or mixed with from pale light brownish olive to pale tawny olive, the head and nape with very little of this brownish wash; interscapulars with large fuscous to black blotches on feathers, these otherwise ashy tilleul buff, basally washed with pale ochraceous tawny; feathers of lower back, rump, and upper tail coverts snuff brown, tipped, edged, and vermiculated with ashy light neutral gray and with subterminal large tear-shaped tilleul buff to whitish shaft spots, laterally narrowly edged with black and sparingly speckled with the same; rectrices cinnamon buff to pale clay color, the lateral feathers palest, the terminal inch pale smoke gray traversed by broad band of dark dull sepia and sparingly speckled with fuscous, the broad dark band occupying more than half the width of gray area and breaking up into a mass of frecklings on median pair of rectrices; below as in *B. u. umbellus*, but barrings more numerous, especially on abdomen, and averaging paler—pale ashy buffy drab, and the tarsus more fully feathered.

Adult (*gray phase*).—Similar to brown phase but with tail feathers smoke gray with no buffy tone; ventral barrings duskier—light brownish olive darkening to sepia on the sides and flanks.

Juvenile.—None seen.

Downy young.—None seen.

Measurements: *Adult male*.—Wing, 172-191 (181); tail, 138-164 (151.8); culmen from base, 25.3-28.8 (27.0); tarsus, 40.3-44.9 (42.6); middle toe without claw, 35.0-39.9 (37.4); unfeathered part of tarsus, 12.0-22.5 (17.4); 20 specimens from Wyoming, Utah, North Dakota, and southeastern Idaho. *Adult female*.—Wing, 165-178 (171.5); tail, 120-147 (133.2); culmen from base, 25.0-27.8 (26.3); tarsus, 36.9-44.7 (39.8); middle toe without claw, 33.2-38.8 (35.0); unfeathered part of tarsus 13.8-21.7 (17.3); 8 specimens from Utah, North Dakota, and northeastern Idaho.

Distribution.—Subclimax deciduous woodland and thickets (cottonwood, aspen, and willow communities) chiefly of the Rocky Mountain Montane Forest (Ponderosa Pine-Douglas Fir Association), Transition Zone, but to some extent also in similar subclimax deciduous communities in the lower fringe of the Rocky Mountain Subalpine Forest (Engelmann Spruce-Alpine Fir Association), Canadian Life-zone; ranges from west-central and central-northern Utah, southeastern Idaho and central western Wyoming, northeastward across Wyoming and the Dakotas to northeastern North Dakota (Walhalla) wherever suitable habitat occurs in this predominantly grassland area. *Bonasa umbellus incanus* intergrades with *umbelloides* in northwestern Wyoming, and southern Manitoba, and probably also in the intervening areas wherever the species occurs in the aspen parklands and along cottonwood bordered streams. This race probably extends to the southern limits of the species' range in the Rocky Mountains and Great Plains region in southwestern and north-central Colorado (Nucla and Estes Park), and in southeastern and central southern South Dakota (Custer State Park and Rosebud). No specimens have been seen to establish this definitely however.

Bonasa umbellus yukonensis Grinnell

Yukon Ruffed Grouse

Bonasa umbellus yukonensis Grinnell (1916:166); Forty-mile, Yukon Territory, on Yukon River, near Alaska boundary.

Adult (*gray phase*).—Similar to that of *Bonasa umbellus umbellus* but much paler, the palest of all races of the species, the whitish areas above more extensive and purer white, less washed with buffy; nearest to gray phase of *incanus* but paler, with more white and with the most extensive tarsal feathering of all subspecies; gray areas of upper parts of head, body, wings, and tail pale neutral gray to smoke gray, the brown, which is restricted to top of head, interscapulars, wings, and middle of back, is pale tawny olive to pale Saccardo's umber; below as in *B. u. umbellus* but more abundantly barred with buffy drab.

Adult (*brown phase*).—Similar to gray phase but with tail between sayal brown and Saccardo's umber, distally vermiculated and washed with smoke gray, feathers of interscapular area, back, and rump with very broad transverse subterminal bands of mummy brown (these bands present but concealed in gray phase); ventral barrings darker—Dresden brown to mummy brown.

Juvenile.—Above much grayer than any available juveniles of *B. u. umbellus*; nearest to specimen of *Bonasa umbellus umbelloides*, the general coloration of upper side of head, body, and wings being drab to hair brown, the interscapulars, scapulars, crown, and upper back being broadly and transversely blotched with fuscous to black, with pale tilleul buff shaft streaks and narrow cross bars of slightly darker tilleul buff; rectrices as in *umbelloides* but slightly more washed with drab.

Downy young.—None seen.

Measurements: *Adult male*.—Wing, 174-190 (182); tail, 129-168 (148.5); culmen from base, 24.9-29.1 (26.8); tarsus, 38.3-45.0 (42.4); middle toe without claw, 34-38.5 (36.7); unfeathered part

of tarsus, 8.8-15.7 (11.2); 34 specimens from Alaska, Mackenzie and northern Alberta. *Adult female.*—Wing, 170-182 (177.6); tail, 127-137 (130.8); culmen from base, 24-27.9 (26.6); tarsus, 38.8-43.5 (41.2); middle toe without claw, 33-37 (34.9); unfeathered part of tarsus, 7.3-14.9 (11.0); 10 specimens from Alaska, Mackenzie, and northern Alberta.

Distribution.—Subclimax deciduous woodlands (willow, aspen, poplar, and birch communities) chiefly in White Spruce-Lodgepole Pine and Black Spruce-American Larch associations, which form the ecotone between the Northern Conifer and Tundra biomes (Hudsonian Life-zone); ranges from western Alaska (Akiak and Nulato) eastward across Alaska, chiefly in valleys of Yukon and Kuskokwim rivers, and across Yukon from Selkirk and the Lewes River Valley, north to La Pierre House, east at least to Great Slave Lake, Mackenzie, and Lake Athabaska, Alberta; extends southward along Liard River, at least to Liard, Mackenzie, and along Athabaska River to Fort McMurry, Alberta. There are records of ruffed grouse from farther east in the Hudsonian Life-zone of northern Manitoba (Brochet and York Factory) which may also belong to this race, but specimens have not been seen to substantiate this. Although primarily a Hudsonian-Zone form, *yukonensis* apparently includes within its range a sizeable area characterized by pure coniferous forest climax (Canadian Life-zone) in southwestern Mackenzie and northern Alberta.

ECOLOGICAL CLASSIFICATION OF BONASA UMBELLUS

Boreal Region

Hudsonian Life-zone

Northern Conifer-Tundra Ecotone (chiefly in subclimax communities)

White Spruce-Lodgepole Pine, and
Black Spruce-American Larch associations

Bonasa umbellus yukonensis

Canadian Life-zone

Spruce-Fir Biome (chiefly in subclimax communities)

White Spruce-Balsam Fir Association (Boreal Forest)

Bonasa umbellus umbelloides

Engelmann Spruce-Alpine Fir Association (Rocky Mt. Subalpine Forest)

Bonasa umbellus umbelloides

Lodgepole Pine-Mountain Hemlock Association (Sierran Subalpine Forest)

Bonasa umbellus affinis

Red Spruce-Fraser Fir Association (Appalachian Subalpine Forest)

Bonasa umbellus monticola

Temperate Region

Transition Life-zone

(1) Northern Conifer-Deciduous Forest Ecotone (in climax and subclimax communities)

Eastern White Pine-Sugar Maple-Eastern Hemlock Association (Lake Forest)

Bonasa umbellus togata

Eastern Hemlock-Yellow Birch Association (Appalachian Montane Forest)

Bonasa umbellus monticola

(2) Grassland-Northern Conifer Ecotone (in climax and subclimax communities)

American Aspen-Paper Birch Association (Aspen Parkland)

Bonasa umbellus umbelloides > *incanus* (intermediate)

(3) Western Mountain Transition Biome (chiefly in subclimax communities)

Ponderosa Pine-Douglas Fir Association (Rocky Mt. Montane Forest)

Bonasa umbellus incanus
Bonasa umbellus umbelloides

Sugar Pine-Ponderosa Pine Association (Sierran Montane Forest)

Bonasa umbellus affinis

Western Larch-Western White Pine Association (Idahoan Montane Forest)

Bonasa umbellus phaios

(4) Pacific Moist Forest Biome (chiefly in subclimax communities)

Western Red Cedar-Western Hemlock Association (Northwest Rain Forest)

Bonasa umbellus sabini
Bonasa umbellus castaneus
Bonasa umbellus brunnescens

Upper Austral Life-zone

Eastern Deciduous Forest Biome (in climax and subclimax communities)

White Oak-Pitch Pine Association (Atlantic Pine-Oak Forest)

Bonasa umbellus umbellus

Red Oak-Beech-Tulip Association (Mixed Mesophytic Forest)
Bonasa umbellus umbellus
Bonasa umbellus monticola
White Oak-Shagbark Hickory Association (Oak Grove Savannah)
Bonasa umbellus medianus

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NOTES ON THE MEARNS QUAIL

By LOYE MILLER

During the first forty years of my interest in ornithology the Mearns Quail (*Cyrtonyx montezumae mearnsi*) was little more tangible to me than the distinguished names which it bears. Furthermore, the intensity of an academic interest was sharpened year by year as its subject continued to elude every attempt at closer contact. So large a number of ornithologists have had a somewhat similar experience that these notes are offered as perhaps acceptable to some who are less fortunate in the ultimate partial realization of that long continued desire.

Many things mark the bird as different from the better known quails of the United States. The cabinet skin, which often is one's only contact with the species, displays a most bizarre pattern, a powerfully arched beak, a large eye, strong legs with long-clawed toes, and the almost tail-less rump of a tinamou. If you are so fortunate as to get the freshly killed bird in hand, you find the bill is actuated by extremely bulky jaw muscles, the eyes really are large and lustrous as in some birds of the deep jungle, the legs are muscled in a remarkable fashion both as to mass and as to coloration of the flesh. In the cleaned skeleton other characters of interest appear. The humerus is long but slender, the pelvis is narrow, the ilium is extended far backward, the free vertebrae of the tail, as might be expected, are markedly reduced, and the leg bones are powerful. A correlation of the bird's peculiar habits with these visible structural characters constitutes the main purpose of this writing.

Coloration.—So much has been said, and so much is still being learned about the subject of camouflage, that I hesitate to discuss at any length the color pattern of the Mearns Quail in relation to survival of the species. Certainly there is a rather thorough breaking up of pattern. The harlequin striping of the head and the guinea-like spotting of much of the body plumage serve that end to perfection. The "dry thatch" pattern of the back would certainly harmonize with the grass tussock in which the bird often crouches when disturbed. The black and dark chestnut of the ventral surface would blend into the shadow cast by the bird's own body. Whatever be the theory pro or con in protective coloration, this species has certainly perfected the practice of immobility as a concealment measure. "Fool Quail" it may be called because it will sit motionless until almost trodden on. However, my own experience leads to the belief that the bird is no fool but rather it is the hunter who is fooled by him. I rather approve of the Fool Quail and his methods.

Beak.—In the montane areas of southern Arizona there grow extensive groves of a live oak known to the local Mexicans as *hallote* (ba-yo'-te) which bears enormous crops of acorns with much sugar and a minimum of tannic acid in the kernel. Tons of this mast are cast upon the ground in the early fall to be gathered by the native populace, human and otherwise. Deer, peccaries, rodents, bears, woodpeckers, jays, pigeons, and our subject, the Mearns Quail, feast upon these acorns. Band-tailed Pigeons are obliged to swallow them whole and even the quail may do so upon occasion. Generally, however, the nuts are shelled and the hard kernel even cut into smaller pieces by the strong bill and powerfully developed jaw muscles. Study of crop contents shows that either method of dealing with this food may be employed.

Large eye.—Certain birds of the deep forest where light intensity is reduced and others, or the same species, which are active during the twilight hours have relatively large eyes. The development does not equal that of the truly nocturnal type but is a

sort of guide post pointing in that direction. The Mearns Quail is not today an inhabitant of deep forest, though he is fond of the thick growth in the steep-walled canyons. Here I have found the birds working out into the open spaces under the live oaks in the early dawn before they were visible to the human eye as more than moving shadows. A possible forest-quail heritage, the large eyes, would here serve them well.

Large foot and claws.—In these same open spaces under the oaks and in the canyon bottoms, there grows a form of perennial grass or small sedge bearing a nut-like tuber on its underground system. These "nutlets" are quite tasty and appeal strongly to the quail, it seems. A considerable amount of digging is necessary to tear up the sod and retrieve the tubers. For this task the species' equipment of long, curved, and powerful claws seems ideal. The bird is not a great runner. He does not travel long distances, either afoot or awing. However, the distinct impression he gives is that of a powerful digger. I have found the tough sod quite extensively torn up where a covey had been feeding upon the "grass nuts" and burrowing larvae.

Tail-less rump.—So many things about this quail have reminded me of the forest dwelling tinamou of El Salvador (*Crypturellus cinnamomeus*). The practically nonexistent tail is one of them. The rectrices are short and weakened to such an extent that little function can remain to them. The free caudal vertebrae and pygostyle are reduced to a minimum as compared with *Lophortyx* which has a well developed skeletal support for the tail. Like the tinamou, the quail's flight is seldom sustained. An explosive rise from almost underfoot, a short dash above or around some obstruction, and the bird again comes to earth. On rare occasions a longer, downhill glide on set wings may be employed. The tail would probably serve but small function in such behavior. I have seen an individual rise from the base of a fifteen foot cliff and disappear over its crest without appreciable horizontal movement.

Slender humerus.—The wing bones of the Mearns Quail, as compared with those of the California Quail (*Lophortyx californica*) are longer but are relatively more slender. The humerus gives the impression also of frailty by having the muscle scars less sharply marked; this characteristic gives the effect of a "blurred" image such as we sometimes get in water-worn fossil specimens. The transverse diameter of the shaft in the two bones is identical whereas the total length in the Mearns Quail is twenty-one per cent greater.

Table of Measurements

		Mearns Quail	California Quail
Humerus	length	39.20 mm.	31.50 mm.
Humerus	width of shaft	3.30	3.25
Ulna	length	37.60	27.80
Carpometacarpus	length	21.00	17.50
Femur	length	39.10	36.40
Tibiotarsus	length	52.00	52.20
Tarsometatarsus	length	30.00	30.00

Just the reverse of this slenderness is true of the bones of the posterior limb. Segment by segment, the lengths of leg bones are almost identical in the two species, but Mearns Quail is by far the more heavily built bird. The bones are greater in their transverse dimensions, yes, but the contours are softened as in the case of the fore limb. The great trochanter of the femur is lower, the femoral head is less sharply set off from its neck, the scar of the gastrocnemius muscle is less marked, and the popliteal pit is shallower. The area of attachment of the gluteal muscle group is larger but is less deeply pitted.

About the head of the tibia this same effect is evident. Both the outer crest and the cnemial crest are less pronounced. Much the same differences were seen in early studies of the American vultures. The extinct *Teratornis* had far less rugged contours of the femur and the tibial head than does the California Condor. These differences were interpreted as indicating less ambulatory power in *Teratornis*. The same correlation is considered proper for the quails. While the Mearns Quail has relatively large legs, they serve him in a different way than do those of the California Quail. He uses them for scratching and for leaping into the air, but his covey is very restricted in its range and he seemingly runs but short distances before either hiding or taking wing. Covies of the birds have repeatedly been located within the same fifteen yards of a canyon's course upon consecutive days or even at longer intervals.

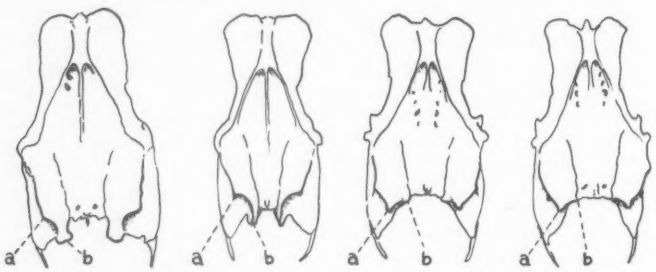

Fig. 28. Line drawings, traced from photographs, showing the pelvis in four genera of quail: left to right, *Dactylortyx, Cyrtonyx, Callipepla, Lophortyx*. *a*, posterolateral spine of ilium; *b*, posteromedial process of ilium (undeveloped in *Lophortyx*). All approximately × ¾. Drawings by Gretchen Lyon Burleson.

Narrow pelvis.—The forest-dwelling tinamou of Central America (*Crypturellus*) differs from the Argentine Martineta (*Eudroma elegans*) in having a narrower pelvis. The Martineta is a desert-dwelling bird living amid the sparsest of vegetation upon the arid pampas where, instead of flying, it runs away from danger, unless too hard pressed (Hudson, Birds of La Plata, 2, 1920:228). *Cyrtonyx* differs from *Lophortyx* and *Callipepla* in comparable fashion. *Cyrtonyx* has much the narrower pelvis and has the "forest-dwelling" habit or what corresponds to it. A correlation between habit and structure here is rather strongly indicated.

A more detailed examination of the pelvis in four American genera of quails proves quite interesting. In *Lophortyx* and *Callipepla* the ischium is prolonged backward far beyond the ilium, the posterior iliac border drops down almost squarely in the ventral direction, and its line of contact with the synsacrum is not projected backward quite so far as is the posterolateral spine (see fig. 28; a). In both *Cyrtonyx* and *Dactylortyx* the axial border of the ilium is extended markedly backward beyond the posterolateral spine almost as far as the end of the ischium and well beyond the end of the synsacrum. A well marked process is thus formed which is pointed in *Cyrtonyx* and truncated in *Dactylortyx* (fig. 28; b).

This backward extension of the ilium serves to enlarge the fossa in which a group of leg muscles find attachment. Much of this bulky muscle complex consists of the iliotibialis (= gluteals, in part) which, with others, passes into the patellar tendon and finally attaches to the crest of the tibia. This powerful muscle group serves to throw the bird into the air in its explosive rise from the ground.

Nature of the muscle.—In the freshly killed specimen there is a striking color pattern in the muscles of the leg. The great iliotibialis is a "white meat" muscle that is almost if not quite as translucent as the pectoralis of the breast and through it certain of the deeper lying muscles show their red color. In the fresh specimen it is extremely hard to differentiate with precision between the individual components of the leg muscle complex and after the tissues are hardened in preservative, the colors are lost. In general, however, it may be said that the gluteal group (iliotibialis) and the gastrocnemius with, perhaps, the tibialis anticus, are the palest muscles. The sartorius, adductors, and the muscles of the axial side of the thigh are colored, certain of the latter being of deepest red. The femorocaudal is colored at its origin and becomes paler and more translucent toward its insertion. The flesh of the thigh thus displays a most interesting and variegated color pattern in the freshly killed bird. Is not this effect due to a physiological correlation with the peculiar habits of the species?

My first skin of the Mearns Quail was prepared after acquaintance with a forest-dwelling tinamou had been established. The instant impression was, "How like the flesh of a tinamou." Several decades of familiarity with the Pacific Coast quails in the flesh left still an element of surprise when handling the fresh specimen of *Cyrtonyx*. The mass of breast muscle is almost gelatinous in consistency and translucent in appearance. As stated above, this is true to a degree in certain of the muscles of the posterior limb as well. What is the explanation of this condition? In his "Text Book of Histology," Dr. J. L. Bremer (1936:135) discusses the skeletal muscles of the rabbit, comparing the red muscle with the white. He states that the red muscle is slightly slower in action but has greater staying power. White muscle, on the other hand, gives a quick flash of power but becomes rapidly exhausted, after which it must recuperate during a rest period.

William H. Hudson (*op. cit.*, 2:222, 224-226) describes the flight of tinamous of the open pampas. The birds are flushed with difficulty; flight is violent and evidently quite exhausting, for they are unable to take wing after the second or third flushing. If given no time to recuperate, they are then easily captured by a well mounted horseman of the pampas. There is good reason to suspect that the visible resemblance, as well as the parallel behavior of the Mearns Quail and forest-dwelling tinamous are carried out still further in the physiological characters of the locomotor muscles and the circulation (the heart of the Mearns Quail seems small for a bird of its size). The quail exhausts its pectoral muscles by its explosive flight but recuperates during its period of concealment. The white muscles of the leg give it the quick energy for the vertical take off, launching it into the air for a good start; still they suffice to serve him without exhaustion in his short range traveling upon the ground. Sustained effort in digging or ordinary walking could probably be cared for by the slower acting red muscle tissue which does not become so quickly fatigued.

The question which comes naturally into the mind at this point concerns the original home of the Mearns Quail. Did it arise from its parent stock as a bird of the semi-arid hill country or did it find there an environment wherein characters evolved in another type of terrain proved to have a positive survival value? Is it so like the forest-dwelling tinamous because of a forest-dwelling heritage, now functional in the broken country of a more desert area? This latter alternative keeps coming to mind and was once expressed in conversation with my good colleague and friend, A. J. van Rossem. He at once stated that, except for color and pattern of plumage, the Mearns Quail and *Dactylortyx* of tropical America might properly be considered as congeneric. Osteological characters of the two birds, however, show differences of greater magnitude

than are commonly found between birds of the same genus. Still the resemblance is sufficiently strong to warrant setting *Cyrtonyx* and *Dactylortyx* quite apart from the more familiar quails of our North American fauna. The large Tree Quail (*Dendrortyx*) of Central America, while it displays an almost rail-like narrowing of the pelvis, has the same general characters of the innominate bone as are seen in *Lophortyx* and *Oreortyx*. Peters, in his "Check-list of Birds of the World" (vol. 2, 1934:57) places *Cyrtonyx* immediately adjacent to *Dactylortyx* in his sequential arrangement. Study of the pelves of the four genera depicted in figure 28 seems to support his point of view.

Breeding season.—Whatever may be the center of origin of the Mearns Quail, it certainly has become adapted to the late summer rainy season of southern Arizona. The winter rains may be quite insufficient to produce a crop of annual grass of any importance, but the summer rains of July and August commonly clothe the broken country in lush greenery brightened with many flowers. Mearns Quail may postpone their nesting activity to take advantage of this late vitalizing of plant and insect populations and bring out broods of young at the end of the summer when food and water would be most favorable for their care. In the Pajarito Mountains west of Nogales, Arizona, broods of small young were being led about by their parents in September of 1931. Annual plants were knee high while insect life was abundant and varied. On December 18 of that same year birds were collected in the same locality which had juvenal feathers still present on the throat where replacement by adult types of plumage was in progress.

Voice.—Despite the many camp sites that have been occupied in Mearns Quail country during various times of the year, I have not made a satisfactory acquaintance with the bird's vocal expressions. Male Bob-white tell you about their ambitions at nesting time. Mountain Quail, California Quail, and Gambel Quail are abundantly vocal and are quite varied in the impulse that inspires expression. Camping in quail country is greatly enlivened by their contributions to the general sound effect. The Mearns Quail appears, however, to be much more nearly a silent bird. I have heard no sound that could be termed a song, mating call, or territorial proclamation such as other quails normally use on their breeding grounds. Not until captive birds were observed did I learn any note other than the startled chirping that is given as the bird flushes from underfoot. Swarth (Condor, 11, 1909:39-43) describes a whistling note "slowly descending the scale." Sounds are extremely hard to describe but I venture to add to Swarth's statement that this call consists of from five to seven notes that drop but slightly in pitch and increase in intensity after about the fourth note. This "descending scale" effect does not usually embrace as much as a whole tone of the standard musical scale. The call is suggestive of that given by a young turkey but the tone quality is less sharp and more of a liquid whistle. The squatting birds respond to it so readily that reassembly of the scattered flock seems the best interpretation of its function.

A second note mentioned by Swarth is the trill. This performance is almost exactly that which young barn-yard chicks give at times when being hovered and strongly resembles the note of certain grass crickets. It could properly be designated a "huddle call." A third note is a deep pitched *gur-r-r* resembling that of a hen warning her chicks. "Warning note" it seems to be.

A fourth note strongly resembles the last half of a turkey hen's *pit-uhrk* and appears in my note book as *e-uhrk*, with a rising inflection.

This last note may be modified into the querulous *que-e-r* suggestive of certain notes of *Otus asio*. Interpretation of notes four and five are not ventured upon yet.

Natural enemies.—In the Mearns Quail country which I have visited, there occur the typical enemies of ground-nesting birds such as snakes, skunks, foxes, road-runners, hawks, ravens and jays. The Gila monster does not venture so high into the mountains. Once a shrike was seen to attack an adult quail just as it came to earth after a short flight, but no damage apparently was done. Two mammals less often considered in American game protection are the collared peccary and the coati-mundi (*Nasua*). Both of these versatile feeders run in bands through the Pajarito Mountains, where most of these observations were made. Nests of Mearns Quail tucked away under the sotol bases or in bunch grass would be hard to conceal from the peccary or from the equally inquisitive nose of the coati. These two mammals might very properly be looked upon as control species of the Mearns Quail. Overgrazing by domestic animals probably is the greatest danger to the species. During my acquaintance with the Pajarito Mountains area, great damage was done in certain localities by the large numbers of wiry and sure-footed Mexican cattle that were crowded into certain parts of the range. The undergrowth was seriously depleted and much damage was done by subsequent erosion. Probably this factor alone was enough to tip the scales against the Masked Bob-white farther to the west.

Acknowledgment.—I am grateful to Mr. W. J. Sheffler and to Mr. A. J. van Rossem for their assistance on many occasions.

SUMMARY

Anatomical studies of the Mearns Quail are here correlated with field studies with the following deductions resulting:

1. Color pattern is of advantage to a species strongly addicted to the habit of complete immobility when alarmed.
2. The strong beak is employed in shelling and breaking up acorns.
3. The powerful claws serve to tear up sod in search of tubers and larvae.
4. Small heart and "white muscle" tissue indicate quick, powerful flight but rapid fatigue.
5. The parti-colored flesh of the pelvic appendages reflects the need for great power in taking wing combined with that for more sustained activity, as in the digging for food.
6. The large eye is suggestive of forest dwelling origin or of crepuscular habit.
7. Secondary resemblance to the forest dwelling tinamous is probably due to similarity of habit.
8. Characters of the pelvis indicate a closer relation to *Dactylortyx* than to the quails of North America proper.
9. The original area occupied by the species was probably tropical forest. Its present arid home is secondary.
10. No song or mating call has been identified among its vocal notes.
11. Natural enemies include the peccary and coati-mundi. Overgrazing is probably the agent of greatest importance in reducing the numbers of the Mearns Quail.

University of California, Los Angeles, February 1, 1943.

DISTRIBUTION AND ABUNDANCE OF THE MISSISSIPPI KITE IN THE TEXAS PANHANDLE

By PHILIP F. ALLAN and PALMER R. SIME

Although the occurrence of the Mississippi Kite (*Ictinia misisippiensis*) in the Texas Panhandle has been reported from time to time, no systematic attempt has been made, to our knowledge, to describe its recent distribution there. Strecker (1910) noted its occurrence near the head of Rush Creek, Armstrong County, and stated that eggs were taken in Palo Duro Canyon by J. M. Carroll in 1905. Bent (1937:69) listed Tascosa, Oldham County, and Lipscomb, Lipscomb County, as places of record for the Mississippi Kite. Stevenson (1942:109) reported it from Palo Duro Canyon and cited several other locations attributed to the senior author of this paper.

The kite, as indicated on the map (fig. 29), differs somewhat in its spatial distribution in Texas from that reported by Sutton (1939) in Oklahoma. Here, instead of being rather generally distributed, it is confined almost entirely to wooded river bottoms. Wherever there are groves of tall cottonwoods (*Populus texana*) in the eastern and central Panhandle, one may expect kites. Ranging out from the groves, they course over the adjoining land, but probably seldom range more than a mile. In fact, recorded observations on 169 kites and general observations on many others indicate a radius of territory not greater than one-half mile.

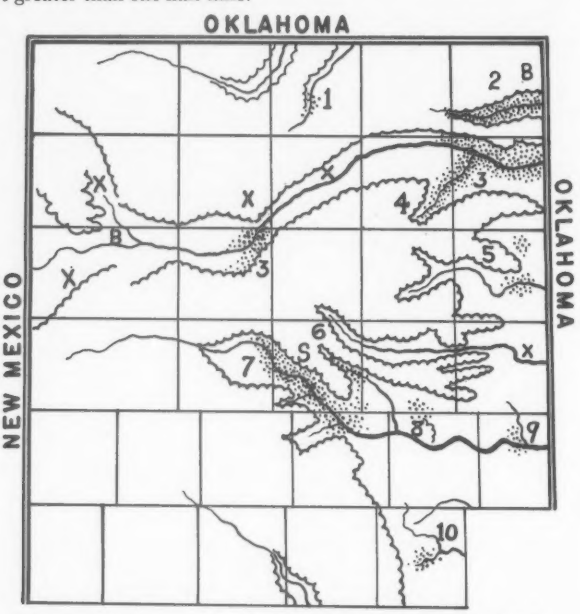

Fig. 29. Distribution of the Mississippi Kite in the Texas Panhandle. Stippling indicates areas where kites have been observed. 1, Palo Duro Creek; 2, Wolf Creek; 3, Canadian River; 4, Red Deer Creek; 5, McClellan Creek; 6, Rush Creek; 7, Palo Duro Canyon; 8, Lelia Lake; 9, Prairie Dog Town Fork of Red River; 10, Pease River; B, recorded by Bent; S, recorded by Strecker; X, counties in which kites may occur.

Ordinarily the habitats on either side of the groves are such as to produce an abundance of insects and reptiles; and here, we presume, the kites find much of their food. Sandhills border the Canadian River and some of its tributaries. These are covered with sage (*Artemisia filifolia*), tall bunch grasses (*Andropogon furcatus*), wild plum (*Prunus angustifolia*), and three-leaf sumac (*Rhus trilobata*), or oak shinnery (*Quercus* sp.). Grasshoppers, cicadas and several species of lizards, small snakes and rodents abound in the sandhills. Other localities support a flora of short to middle-height grasses (*Buchloë dactyloides, Boutcloua gracilis, Sporobolus cryptandrus*). The rocky escarpments usually bordering Mississippi Kite habitat are rich in invertebrate and lower vertebrate forms (fig. 30).

Fig. 30. Typical habitat of the Mississippi Kite in Potter County, Texas.

On June 2, 1938, two nests were found, one of which contained two eggs and a fresh cottonwood twig. This nest was situated in Woodward County, Oklahoma. It was about 40 feet up in a cottonwood. The second nest was found in Ochiltree County, Texas, about two miles west of the Lipscomb County line. The nest could not be reached, for it was on an overhanging limb about 60 feet from the ground in a large cottonwood. A year-old bird, judging from published descriptions of plumage, sat beside this nest, while 4 adults were seen within 200-300 yards. On July 4, 1938, a nest was found in a small cottonwood in Palo Duro Canyon, Armstrong County. This nest was empty. Four kites were seen near by.

Generally, the Mississippi Kite arrives in the Panhandle during the middle to latter part of May. Our earliest recorded date was May 4, 1939, when three were seen in Lipscomb County. Our observations agree with those of Sutton and others that the kites move in small flocks. We often noted them in groups of 3 to 9, and on May 28, 1939, we saw a flock of 23 at the Canadian River bridge, Potter County. Subsequent observations at the same place revealed that most of them had moved on, for we recorded 2, 1, and 3 there on June 3, July 21, and August 1, 1939, respectively. Kites depart late in August and early in September. Our latest fall observation was September 25, 1939, when 3 were seen in Hemphill County.

Mississippi Kites seem to reach their greatest abundance along the Canadian River, principally in Hemphill County. They are abundant also in Ochiltree County along Wolf Creek. Kites are common in Potter, Lipscomb, Armstrong and Briscoe counties. Small numbers were seen in Roberts, Randall, Donley, Motley, Wheeler and Childress counties, while a single bird was seen in Hansford County along Palo Duro Creek (not Palo Duro Canyon). They should be watched for along the Dry Cimarron in Union County and the Canadian River in Quay County, New Mexico—a state from which they have not been reported.

Most of our observations on kites were made as a part of a highway hawk census (Allan and Sime, 1943). A considerable percentage of our travels was outside of Mississippi Kite habitat, but for comparative purposes the data presented in the table show the relation of birds seen to the miles traveled both within their habitat and in all the Panhandle. Under the assumption that the radius of territory is about one-half mile, there is at least one, and probably a pair of kites per 2.0 square miles of suitable habitat in the Panhandle, but in optimum habitat there may be a pair or more to the square mile. We never saw any evidence of antagonism between neighboring pairs and the only pursuit observed consisted apparently of play; it occurred at a long distance from any possible nest site and long after the nesting season.

Relative Abundance of Mississippi Kites, 1939-1941

Year	Number seen	Miles[1]	Rate[2]	Total miles[3]	Rate[4]
1939	117	221	1.8	6604	56.4
1940	29	56	1.9	585	20.1
1941	23	66	2.9	1617	70.3
Total	169	343	2.0	8806	52.1

[1] Miles traveled within kite habitat. [2] Miles per bird seen.
[3] Total miles traveled during period (both within and outside of kite habitat). [4] Miles per bird seen in all travel.

Farmers and ranchers with whom we talked designated this kite as a "Blue Hawk," if they recognized the bird at all. None of them considered the Mississippi Kite harmful, and therefore, we presume, they do not shoot it. However, since hawk shooting is a prevalent practice in the Texas Panhandle, this bird undoubtedly receives attention as a target along with the other twelve or more beneficial native falconiform birds.

Summary.—The Mississippi Kite (*Ictinia misisippiensis*) occurs rarely or abundantly in at least thirteen counties of the Texas Panhandle and has been reported from one additional county (Oldham). The kite probably occurs in five other counties.

2. It is a bird of wooded river bottoms, principally, seldom ranging more than a half mile from its nesting area.

3. Although a few appear early in May, the majority of kites arrive in the latter part of that month, usually in small flocks. Fall migration probably starts in mid-August and ends in the latter part of September.

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Soil Conservation Service, Washington, D. C., and United States Army, Lubbock, Texas, February 13, 1943.

THE SPRING MOLT OF THE GAMBEL SPARROW

By HAROLD MICHENER and JOSEPHINE R. MICHENER

A picture of the population of Gambel Sparrows (*Zonotrichia leucophrys gambelii*) at our banding station near the center of Pasadena, California, may be described as follows: Among the first arrivals in late September and early October of each year there are more adults than immatures. These include a few returns from previous years. In November and December there are fewer new birds, arriving the first time for the season; but a small number of birds, about equally divided between adults and immatures, repeat in the traps frequently, thus indicating that they are staying in the vicinity during this period. In January a rise in the number of new birds is conspicuous, immatures outnumbering adults. This continues until the end of their stay in the region, the latter part of April with an occasional bird in early May. At any time during the presence here of the species, trapping records suggest that individuals may stay in the neighborhood for a prolonged visit or may appear at intervals throughout the season, thus indicating a winter residence in the vicinity. On the other hand, many, especially those trapped in October and from January to May, are trapped but once, which suggests that those caught in October are on their way south and those taken from January to May are working their way northward.

In the Gambel Sparrow seasons of 1937-38, 1938-39, and 1939-40 a study of the spring molt was undertaken. For the three seasons 412 birds were in the traps a total of 1222 times. As soon as the birds began arriving in the fall, their plumages were examined critically and on many of them the remiges, rectrices and some of the larger of the other feathers such as wing coverts were notched. This notching was recorded and on subsequent visits of the birds it served as an infallible check on all other indications of the molt of these feathers.

The following report of the results obtained is not offered as a complete thesis on the spring molt of the Gambel Sparrow for two reasons. First, the observations were made only in one small locality. The birds that spend the winter farther north or farther south may molt differently. The former are never seen here and the latter may be seen here on one or both of their migration journeys. Second, some of the birds leave on their northward migration before their molt is completed. Law (Condor, 31, 1929: 208-212) reported upon the spring molt of several species of *Zonotrichia*. We have been able to examine many Gambel Sparrows and to follow the molt through in retrapped immatures and adults. Thus it is possible now to add to and substantiate in part the account given by Law.

Recognition of extent of molt.—During the period of the spring molt of the species there should be no doubt as to whether the molt has not started or has been completed in any individual bird except in adults late in the season and even then there is usually sufficient evidence for a reasonably safe conclusion.

Any bird on which partly developed feathers can be found in bilaterally symmetrical regions is considered to be molting. Replacement of feathers fortuitously lost is rarely confusing. A bird in immature plumage in which the molt is not in progress definitely has not molted. Late-in-the-season adult birds which do not show the molt to be in progress usually show sufficient evidence that the molt has been completed by the absence of appreciable wear on those feathers that usually molt in the spring and by the greater distinctness of the diurnal bars in the two middle tail feathers as compared with the other tail feathers (Michener and Michener, Condor, 40, 1938:149-160). It

should be borne in mind, however, that the rump feathers and upper tail coverts, feathers which show the greatest wear when old, are not always molted in the spring and that new feathers in these areas sometimes show appreciable wear soon after they are fully grown. These considerations make it seem advisable to place little weight on the few members of this comparatively small group of late-in-the-season adults which do not show unmistakably whether they have or have not molted.

Time and duration of spring molt.—The earliest indication of the molt was seen on January 28 in two or three new quills on each side of the breast of an immature bird. From this date on the number showing the beginning of the molt increased daily until by the first of March a bird not showing the molt in progress was rare. However, some continued to be found until April 3, the latest date upon which one (an immature) showing no trace of the molt having begun was trapped. At this time other late ones show that their molts had just begun. These late molters were all new birds in the traps; at the same time there were some new birds well advanced in the molt. In other words, all those known to have wintered in the immediate vicinity began to molt before March 1 and when some of them had almost completed the molt others were appearing, some of which had not begun or were just beginning it. Where these latter wintered is not known.

Thus it is concluded that the spring molt may begin at any time from late January to early April. For those that began to molt in January and February and were under close observation because they were frequently trapped winter residents, the duration of the molt was about two months. For the birds that began to molt later than February the time of molt completion could not be determined because practically all of them left before the first of May. It is certain that some are still molting during at least part of their northward migration. It is known that some molt fewer feathers than others and it is suspected that the latest to begin the molt renew the fewest feathers. The upper tail coverts, the rump feathers and the upper greater secondary coverts are not molted in every case and one bird was captured late in the season that had not molted the two middle tail feathers. Do any arrive on their breeding grounds with immature plumage and why do some molt so much later than others? We have no information to answer these questions but we suspect that a few arrive at their summer home with brown head feathers.

As evidence of the time required for completion of the molt the following record is offered. An immature (40-93008) had two or three quills on each side of the breast on January 28. On April 3 the molt was completed except for a few quills in the femorals. Another immature (39-55844) showed new quills on the back of the neck, in the occipital region, at the base of the bill and on the throat on January 29. On April 6 the molt was completed except for young feathers, not completely expanded, in the coronal and postventral regions. This set of observations is corroborated by many other records of immatures.

Complete records were not obtained for individual adults but from parallel progress during portions of the molt we are convinced that an adult molting the same number of feathers as an immature will do so in approximately the same time.

Feather tracts involved in spring molt.—The outstanding feature of the spring molt of the Gambel Sparrow is the variability among the tracts in which it originates and in the rate of progress within each of these tracts. Throat, breast, back of head, back of neck, inner surface of leg are all places where it shows first, beginning, on different birds, in only one or in any combination of these places. In the latter case it sometimes proceeds much more rapidly in one area than in another and sometimes in all areas at

about the same rate. A throat entirely bare or covered with tiny pinfeathers is common. Other birds show a gradual dropping and replacement of these throat feathers.

Almost as soon as such a beginning is made in any of these tracts which are among the first, other tracts are involved. The participation of the various tracts in the molt will be discussed in the approximate order and with the same nomenclature as used in our paper on the molt of House Finches (Michener and Michener, Condor, 42, 1940: 140-153).

The primaries are not renewed at the spring molt but a few exceptions were observed. Two birds replaced primary 9 on each wing and two replaced both 8 and 9 on each wing.

The upper greater and the upper middle primary coverts are not molted.

The upper carpometacarpal coverts are not molted.

Secondaries 7, 8 and 9 (tertials of Law) are practically always molted, 8 dropping first, then 9, then 7. Two birds were observed which molted secondary 6 and one which failed to molt secondary 9. These feathers on these birds were notched so that there is no possibility of error in judging which ones were molted.

The upper greater and the upper middle secondary coverts are practically always molted although of the former there were a number of cases in which only the proximal portion of that tract molted, with the further exception that the most proximal feather frequently was not molted.

The carpal covert, the alula and the alula coverts are not molted.

In the upper marginal coverts only a few feathers in a few individuals were found to be molted.

Feathers in the humeral tracts begin to fall at the anterior end, and the whole tract is molted in an orderly manner.

The under greater and under middle primary coverts are practically never molted. In one bird often examined one or two new pinfeathers were seen in the proximal ends of these tracts but no other feathers of these rows were renewed.

The under carpometacarpal coverts were never found molting.

The under greater and under middle secondary coverts are all molted in some cases and in others only the proximal feathers of each tract are renewed.

The under marginal coverts are renewed in many cases and no birds were seen in which it was known that they were not molted. Determination is difficult in this tract unless pinfeathers are found.

The scattered feathers of the under surface of the upper arm in all cases are molted early in the progress of the molt.

The capital tract is completely molted usually beginning in the occipital region. In many instances the time required for completion of the head molt is the time required for the entire molt. The occipital region is one of the earliest spots to show the molt and the coronal region is one of the places to hunt for the last pinfeathers. However, some individuals begin the head molt in the coronal region and a few begin it at the bill at the same time as in the occipital area, but in no case observed did it begin at the bill and proceed steadily backward to the occipital and neck regions.

The spinal tract begins its molt anteriorly; it progresses caudally but is incomplete as it approaches the caudal tract. In the rump of every bird observed there were old, worn feathers left. In some few birds only a few of the rump feathers were molted.

The ventral tract molts completely, beginning anteriorly and progressing caudad.

In the caudal tract, usually rectrices 1-1 are molted and the other ten are not. In only two birds observed did rectrices 1-1 fail to molt. In a few cases 1-1 and 2-2 molted.

In one bird 1-1 and 6-6 molted and in another 1-1, 2-2, 3-3 and 4-4 molted; 3-3 and 4-4 being short at the time of observation. The upper tail coverts are completely molted, partly molted or, in a few cases, not molted at all. In the under tail coverts and the lesser under tail coverts it was harder to distinguish old from new than in the upper tail coverts, but in many instances there was no doubt that all of them were replaced. The postventral region and the anal circlet are completely molted.

The crural tract is completely molted. The inner surface of the leg is usually molted all at one time.

The femoral tract is most variable. In one case it was found a mass of young pinfeathers, all the same age. In others a quill or two appeared at the anterior end and the molt progressed posteriorly to be completed about the time of completion of the entire molt. This tract is one to search for the last traces of the molt. In some birds all feathers were replaced and in none was there no molt in the femoral tracts. But this area seemed to lack the orderly replacement of the humeral feathers. So often only one or two pinfeathers were found at one time that it is suspected that the molt may be variable in completeness as it is in the rump.

It would be of interest to supplement this study with an examination of the molt of these birds on both the more northern and the more southern areas where they winter and then to study the molt of late summer and fall.

A few individuals of *Z. l. pugetensis* appear here late in the *gambelii* season and, for the sake of placing them on record, we append here our meager notes on the molt of that subspecies. Of four that were caught on April 23 to 25, 1938, we noted that the molt was very much delayed. This was in comparison with *gambelii*, of course. On April 15, 1940, two were caught and taken to Mr. George Willett at the Los Angeles Museum who identified them as *pugetensis*. One, an adult, showed the molt not yet begun and the other, an immature, showed it just beginning. These individuals are too few and we are too far out on the edge of the winter range of this subspecies for us to say that their molt is typical of the subspecies.

Pasadena, California, March 8, 1943.

A NEW RACE OF CANADA JAY FROM COASTAL BRITISH COLUMBIA

By ALDEN H. MILLER

Jays of the genus *Perisoreus* range westward through the coastal mountains of central British Columbia but do not occur in the archipelago of this section or in southeastern Alaska. The southern coastal species, *Perisoreus obscurus,* extends north only to Vancouver Island and in the coast ranges reportedly as far north and east as Lillooet (Brooks and Swarth, Pac. Coast Avif. No. 17, 1925:79-80). Although there is recurrent surmise that *Perisoreus obscurus* and *Perisoreus canadensis* merge in southern British Columbia, I have yet to see an adequate account of evidence showing that these two species interbreed (note Hellmayr, Cat. Birds Amer., 8, 1934:69). Certainly they do not in central Oregon where they approach each other within 30 miles and maintain sharply their distinctive characteristics. Somewhere north of the Lillooet district in the coast ranges, *Perisoreus obscurus* is replaced by *P. canadensis,* for in the latitude of Bella Coola (52°30′) *canadensis* has been taken repeatedly.

In an earlier study of Canada Jays (Miller, Trans. San Diego Soc. Nat. Hist., 7, 1933:287-298) specimens from central British Columbia were found to be equivalent to *P. c. canadensis* from other parts of the range of that race; the merest suggestion was made (p. 290) that they were darker and of more neutral hue than birds from northern British Columbia and from Minnesota. This conclusion was based largely on material from the interior, in the Cariboo District, although I had available then a few apparently similar birds in worn spring plumage from Anahim Lake and Hotnarko River in the coast range east of Bella Coola. Recently I have been able to assemble a series of eleven specimens from slightly farther west, all of which bear some fresh feathers and eight of which are in complete fall plumage. These birds are remarkably distinct from *P. c. canadensis* and are by far the darkest Canada Jays known from western North America. They parallel in trend of differentiation the dark *P. c. nigricapillus* of Labrador. Although I have not compared them with that form directly, I should judge that they surpass it in darkness of dorsal color (see Austin, Mem. Nutt. Ornith. Club, 7, 1932:158).

The backs of these freshly plumaged birds are so sooty as to match almost exactly the peculiarly dark juvenal plumage of the species. Two thoughts come to mind in searching for an explanation for this heavy pigmentation: (1) These jays may register the "effect" of a humid environment, as do many races of animals in coastal British Columbia, even though in this sector they actually are restricted to the western extension of an interior type of forest. (2) They may constitute a relic stock of Canada Jays in which the adult plumage remains like that of the juvenile and hence presumably like that of the ancestors of the group. I am inclined to favor the latter idea as at least a partial explanation. *Boanerges* [=*Perisoreus*?] *internigrans* of Szechwan, China, is a possible ancestor of *Perisoreus canadensis* which resembles the juvenal plumage of the New World species according to Suschkin and Stegmann (Jour. für Ornith., 77, 1929:404).

The dark race of coastal British Columbia may be known as

Perisoreus canadensis pacificus, new subspecies
Pacific Canada Jay

Type.—Male, no. 80743 Mus. Vert. Zool.; Mount Brilliant, 5000 feet, Rainbow Mountains [north of Bella Coola River], Coast District, British Columbia, September 12, 1940; collected by Hamilton M. Laing.

Diagnosis.—Similar to *Perisoreus canadensis canadensis,* but dorsal coloration darker and sootier (near Dark Mouse Gray of Ridgway, Color Standards and Color Nomenclature, 1912), hence less brown; in fresh plumage, dorsal gray collar of neck inconspicuous and in some individuals obsolete; white of forehead of same extent and comparably suffused with gray in fresh plumage, but not noticeably buffy as in *P. c. fumifrons*; size as in *P. c. canadensis.*

Range.—Thus far known only from the Rainbow Mountain area at the headwaters of the Dean and Bella Coola rivers, in the central coast range of British Columbia.

Measurements.—Type: wing, 143.6 mm.; tail, 145.5; bill (from distal edge of nostril), 15.0; tarsus, 35.7. Average, standard deviation and extremes of 7 males (compare table in Miller, *op. cit.*: 292): wing, 145.65, σ 5.70, 136.3-152.0; tail, 143.81, σ 4.54, 134.4-151.0; bill, 14.41, σ 0.29, 14.1-15.0; tarsus, 34.81, σ 0.61, 33.9-35.6.

Comparisons.—The race *P. c. pacificus* shows no approach in characters to *Perisoreus obscurus* of southwestern British Columbia. The coloration dorsally is blue or neutral gray, rather than brown as in *obscurus,* the shaft streaks of the back feathers are no more apparent than in any race of *P. canadensis,* and the underparts are deep gray posterior to the throat, not whitish and uniform as in *obscurus.*

Compared with *P. c. fumifrons, pacificus* is not only distinctly darker dorsally but less brown. *Fumifrons* does not approach *pacificus* geographically since *P. c. canadensis* intervenes in northern coastal and interior British Columbia, extending south to the Skeena River valley and west along the Stikine River valley to Flood Glacier (Brooks and Swarth, *loc. cit.*; specimens in Mus. Vert. Zool.). *Fumifrons* apparently occurs no farther south and east on the coast of Alaska than Cook Inlet.

Acknowledgment.—I am indebted to Dr. Louis B. Bishop and to Mr. Hamilton M. Laing for loan of the specimens necessary for this study. Mr. Laing collected the entire series upon which the new race is based.

Museum of Vertebrate Zoology, Berkeley, California, February 28, 1942.

FROM FIELD AND STUDY

An Unusual Attitude in a Hawk.—In the Ibis for October, 1939 (p. 622), Mr. M. E. W. North records a curious attitude of the Black-shouldered Kite (*Elanus caeruleus*). "In February 1937 I watched a bird, perching on a tree, which had a curious habit of raising its tail till this stood vertical, or even sloped in the direction of the back so that its under-side was uppermost." This brought to my recollection that I had seen a similar habit in the White-tailed Kite (*Elanus leucurus majusculus*), when I was studying the species in California in 1923. Under date of August 21, I find in my diary the following note: "A White-tailed Kite is still around; when at rest it frequently elevates the tail almost like a wren." Later I saw a kite with its tail so high over its back that the outline of the bird suggested the letter "V". I sketched this extraordinary attitude (for an accipitrine bird) but cannot find the drawing now. Evidently the habit is an ancestral one. It may be well known to other observers but I cannot recollect seeing it mentioned in any published accounts; in one of these the kite is said to tilt its tail several times in the manner of a Sparrow Hawk, but the pose with the tail elevated almost vertically is nothing like the pumping action of a Sparrow Hawk's tail which is simply a wagging motion to be seen in many birds and in several other species of hawks.—ALLAN BROOKS, *Okanagan Landing, B. C., March 8, 1943.*

Starling in Western Montana.—The spread of the Starling (*Sturnus vulgaris*) in the United States has recently been discussed by Wing (Auk, 60, 1943:74-87). He states that the first records in a new area are usually of a few winter stragglers. Such was the case of the first birds to come to my attention in western Montana. Five or six were seen in company with a wintering flock of Red-winged and Brewer blackbirds near Corvallis, Ravalli County, on January 25, 1941. I saw the Starlings again at the same locality the following week, but was not able to obtain specimens either time. More recently on November 14, 1942, I shot into a large flock of migrating Red-wings near Round Butte, Lake County, and obtained two Starlings along with several Red-wings. It is likely that there were several more Starlings present in this flock. I have not found recorded instances of the presence of Starlings in western Montana. Starlings were observed in eastern Montana near Billings, which is 300 miles east of the above-mentioned localities, on December 23, 1940, by Louis M. Moos and Donald Graves (Audubon Magazine, 43, 1941:135).—PHILIP L. WRIGHT, *Department of Zoology, Montana State University, Missoula, Montana, February 16, 1943.*

Flight Speed of the Mourning Dove.—On July 18, 1942, while driving between Woodburn and Donald, Oregon, I checked the flight speed of the Mourning Dove (*Zenaidura macroura*). The bird jumped off the road in front of the car and flew directly in front of it for more than three-quarters of a mile at a speed of from 30 to 35 miles per hour. It did not seem to be flying with special effort.—FRED G. EVENDEN, JR., *Oregon State College, Corvallis, Oregon, February 15, 1943.*

Speed of Flight of Mourning Doves.—Recent comment on the speed of flight of Mourning Doves (*Zenaidura macroura*) prompts me to record an observation made during a recent trip east. Just east of the Painted Desert, between Holbrook, Arizona, and Gallup, New Mexico, we were paralleled by a pair of flying Mourning Doves as we drove at 43 to 45 miles per hour. These birds flew beside us for well over a mile (noted as "1-2 miles"), finally turning aside. They were therefore flying at this rate for considerable distances, and apparently without any stimulus other than the well known "fixation of the image" which may have led them to fly beside us.—S. C. BROOKS, *Department of Zoology, University of California, Berkeley, California, February 16, 1943.*

Another California Record of the American Redstart.—On September 30, 1942, shortly after 9 a.m., an adult female American Redstart (*Setophaga ruticilla*) was found in one of our water traps at Manor, Marin County, California. This particular trap is situated next to the American warblers' aviary which contains several examples of a number of species of this family of birds.

The redstart, upon being removed from the trap, was found to be in a somewhat emaciated condition. Moreover, the bird's upper mandible was considerably shorter in length than the lower one and presented a somewhat shriveled, atrophied appearance.

Because of its comparative rarity on the California list, an effort was made to maintain it alive for the aviary collection. Notwithstandnig our painstaking efforts, it succumbed three days later, on October 3.

While some difficulty was experienced in the "breaking-off" process, that is, the weaning of

newly caught insectivorous birds from their natural diet to artificial food, this initial difficulty was successfully overcome. It was noted from the outset, however, that the bird had trouble in picking up its food; the abnormal mandible apparently interfered. Only after making several abortive attempts would the bird succeed in picking up particles of "soft food" supplied it. Maimed insects, such as moths, flies, and small green caterpillars, would also present a problem and while snapped at repeatedly were, for the most part, "nosed" around. Some that were successfully picked up would be rolled around in the mandibles, with the bird apparently making every effort to swallow in the normal way. Some would finally be gulped down, while others would be dropped only to be picked at again and again in what might turn out to be a futile effort to retrieve them.

To minimize this feeding difficulty we finally placed all insects on top of the artificial food. This seemed to help and all during the third day and prior to its death the bird ate freely of not only the maimed insects but also the substitute food. Notwithstanding, we were unable to keep it alive, and it is now specimen no. 58014 in the collection of the California Academy of Sciences, Golden Gate Park, San Francisco.

Undoubtedly the deformed bill militated against the free feeding of the bird and produced the emaciation noted at the time of its capture. It might also have been the causative factor which prompted the bird to stray so far from its normal migration route. In captivity it proved comparatively tame for a newly caught bird, another obvious indication of its handicap.—ERIC CAMPBELL KINSEY, *Manor, Marin County, California, February 15, 1943.*

Remains of a Swan from the Miocene of Arizona.—In 1938 L. L. Hargrave forwarded as a gift to the United States National Museum some fragments of fossil bone (cat. no. 15,772) secured one-fourth mile from the Gray Ranch below Wickiup Post Office, Mohave County, Arizona. They came from a Miocene deposit. The largest is nearly one-half of the proximal end of a coracoid that is somewhat crushed and distorted but that can be recognized as belonging to the family Anatidae and to be similar to *Cygnus*. It has the size of the Trumpeter Swan (*Cygnus buccinator*) and possibly it may represent an allied species in the genus *Cygnus*. Due to deformation of the head of the bone, however, it does not seem practicable to make a certain generic diagnosis. A smaller fragment comes from lower down on the shaft of the coracoid. Apparently this fragment formed part of the same bone mentioned above.

While it does not seem desirable to give these specimens a name at the present time, they serve to indicate the earliest record for a swan in the fossil beds of our country.—ALEXANDER WETMORE, *United States National Museum, Washington, D. C., March 8, 1943.*

Food-washing Habit of the Dipper.—On April 12, 1941, I had the opportunity to watch a pair of Dippers (*Cinclus mexicanus*) feeding young at a nest on the North Fork of the Molalla River, Clackamas County, Oregon. The insects and grubs which the parents brought were washed in the water before being taken to the nest. While food was held crosswise in the bill, the head was twisted rapidly from side to side in the water. After washing the food, the bird flew directly to a ledge below the nest.

The nest was 7½ feet above the water's edge and well hidden in the moss that covered the upper reaches of the bank. It was buried deep in the soil and moss. The opening was low on the side. About 16 inches below this opening was a small ledge on which the parent birds alighted. This ledge and the nest opening were both under an overhanging projection of the bank.—FRED G. EVENDEN, JR., *Oregon State College, Corvallis, Oregon, February 15, 1943.*

White-fronted Goose in Idaho.—On December 6, 1942, one of my students brought me a White-fronted Goose (*Anser albifrons*) collected about ten miles north of Pocatello, in Bingham County, Idaho. It was an immature male. Dr. J. W. Aldrich assures me that there is no record of this species for Idaho. It should, therefore, be regarded as a new species for the state.—VICTOR E. JONES, *Southern Branch, University of Idaho, Pocatello, Idaho, March 11, 1943.*

Notes on Three Birds from Lower California.—In the summer of 1928, the late Donald Dickey spent several weeks cruising in the Gulf of California. Many mainland and insular points were touched, although usually not for more than a day or two at a time and often for only a few hours. The primary object of this trip was pleasure; and although Mr. Dickey made voluminous notes, these deal for the most part with fish and fishing, with correspondingly scant attention to birds and mammals. Little collecting was done although a number of specimens were brought home in frozen storage. The following items pertaining to Lower California are of interest.

Coragyps atratus. Black Vulture. This species is listed as present at Cerralvo Island on May 22, although in what manner or numbers is not stated. This appears to be the first record for Lower California. The recent intrusion of this species into southern Arizona and its change in status there from casual to common has been documented by several observers; hence, the present record is of historical interest should Lower California become part of the regular range. It may be mentioned in passing that the absence of Black Vultures in Lower California never fails to create speculation by observers familiar with its abundance on the Sonora side of the narrow Gulf. There is food in equal abundance, particularly about towns, ranches and fishing camps, climatic conditions are essentially identical, and the opposite shores are visible, even to human eyes, in clear weather.

Parabuteo unicinctus superior. Northwestern Harris Hawk. A nesting pair, found on San José Island on May 23, seems to be the first record for any of the Gulf islands at any season. The male was collected and prepared as a skeleton. There would seem to be no reason why this hawk should not occur generally on the larger islands, particularly on those on which iguanas are numerous. However, I have never so observed it.

Haematopus palliatus frazari. Frazar Oyster-catcher. In his "Life Histories" (U. S. Nat. Mus. Bull. 146, 1929:322), Bent, quoting Carl Lien, says of the Black Oyster-catcher: "If occasion requires these birds are good swimmers and, if pursued when crippled, will dive deep and long." Perhaps this ability has been noted elsewhere, although a cursory survey of available literature fails to disclose further mention of it. Under-water swimming by a wounded Frazar Oyster-catcher was observed by Mr. Dickey under such favorable circumstances (Cerralvo Island, May 22) that his notes are worthy of record: "Wounded a Frazar's Oyster-catcher among the cobbles along shore and as I went to pick her up, . . . she flew out a hundred yards over the water. [The bird was pursued in a skiff.] The water was perhaps 3 fathoms deep over sand so you could see every move under the surface, and I was astonished as we approached within 6 feet of our bird and I was getting ready to lean out and grab it, to see it dive as neatly as a true water bird rather than shore bird. Time after time it would let a hand get within 3 feet of it, then give its shrill whistle and shoot down like a plummet 6 to 10 feet under the surface and swim about there for some time by use of feet and wings. The latter were of course its main dependence and gave it considerable ability in this element. It tired after a dozen consecutive dives. . . ."—A. J. VAN ROSSEM, *Dickey Collections, University of California, Los Angeles, March 5, 1943.*

Large Set of Eggs of the Anna Hummingbird.—On April 15, 1943, I was shown a nest of the Anna Hummingbird (*Calypte anna*) by a friend who had found it on the afternoon of April 14 while he was cultivating his orange orchard. The nest was saddled on a drooping limb about three feet from the ground on the north side of the tree. My friend told me that the young were just hatched, and he wished me to take a look into the nest. Imagine my surprise when I found two newly hatched young and an infertile egg. There had been a hard thundershower the night before, but the nest was well protected by leaves, and the female was sitting closely when I examined the nest.—SIDNEY B. PEYTON, *Fillmore, California, April 15, 1943.*

NOTES AND NEWS

Fig. 31. Alexander Wetmore, Assistant Secretary of the Smithsonian Institution, past president of the American Ornithologists' Union and authority on fossil birds.

In lieu of appropriate and deserving review, precluded because of lack of space, we call attention to several recent publications of special importance and usefulness:

The Ducks, Geese and Swans of North America, a Vade Mecum for the Naturalist and the Sportsman (American Wildlife Institute, Washington, D.C., 1943), by F. H. Kortright.

Bird Display, an Introduction to the Study of Bird Psychology (Cambridge University Press, 1942), by E. A. Armstrong.

The Roseate Spoonbill (Research Rept. No. 2, National Audubon Society, 1942 [=1943]), by R. P. Allen.

The Birds of Cape Prince of Wales, Alaska (Proc. Colo. Mus. Nat. Hist., 18, 1943:1-113) by A. M. Bailey.

Ten-year Index to the Auk, volumes 48-57, 1931-1940 (Amer. Ornith. Union, 1941 [=1943]), by H. S. Swarth and G. Willett.

Mr. John Laughlin of 900 Tildon Street, West Riverside, California, would appreciate receiving any information available about non-native doves in California. He is compiling information for a paper on this subject. Details, no matter how trivial, are likely to be of importance. Interest centers especially in mating, nesting, food, rapidity of spread, dates and methods of introduction, and economic aspects.

The inappropriateness of the use of the word "common" as part of a vernacular name of a bird came forcefully to our attention while reading Snyder, Logier and Kurata's faunal paper on the Sault Ste. Marie region of Ontario (Trans. Royal Canadian Inst., 24, 1942:99-165). We note on page 142 the following: "Common Shrike.—An uncommon breeding bird of . . .," and "Common Starling.—A fairly common bird of . . . ." The criticism here is not one of the authors cited, but of a "common" practice.—A.H.M.

MINUTES OF COOPER CLUB MEETINGS

NORTHERN DIVISION

JANUARY.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, January 28, 1943, at 8:00 p.m., in Room 2503, Life Sciences Building, University of California, Berkeley, with Harvey I. Fisher presiding and about 40 members and guests present. Minutes of the Northern Division for December, 1942, were read and corrected. There were five proposals for membership, all by Alden H. Miller: Gordon L. Bolander, 464 Fair Oaks Street, San Francisco, California; Verna R. Johnston, Thorton Township High School, Harvey, Illinois; James Kirkland Merrit, Taft School, Watertown, Connecticut; Clark E. Holscher and Edwin Joseph Woolfolk, both of the Forest and Range Experiment Station, Missoula, Montana.

The chairman of the nominating committee, Mrs. Amelia S. Allen, presented the following slate of officers for the coming year: President, Robert C. Miller; Vice-president, Lewis W. Taylor; Corresponding Secretary, Hilda W. Grinnell; Recording Secretary, Frances Carter. It was moved and carried that the nominations be closed and the secretary be instructed to cast an unanimous ballot for the officers named.

The chair was then accepted by the new president. Mr. Miller recalled his first attendance at a Cooper Club meeting, in the old sheet-iron museum building, at which time the idea that he would one day be president of the organization would have come as a great surprise to him.

Mr. Milton Ray reported the occurrence of a Raven in Golden Gate Park, San Francisco, on December 9, 1942. Robert C. Miller added that this species occurs there occasionally. Milton Seibert reported a Road-runner in the hills of

east Oakland on December 27. At Mills College he had noted a few Slate-colored Juncos in a flock of about 80 Oregon Juncos. Among these was one albino with white patches on the cheeks. Mr. Covel mentioned a great concentration of waterfowl on San Leandro Bay, which he had noted on January 4. He also said that a company magazine in Richmond had printed a notice in the interest of securing information on color-banded gulls. Robert Storer has been helping in the matter of publicity among those who may have opportunities to make observations. Mrs. Austin reported sighting four gulls on Lake Merritt on January 23 bearing bands from the Egg Island (Salt Lake) and Utah Lake stations.

As speaker of the evening, Mr. Alden H. Miller gave an account of a winter visit to the Honey Lake Region with Harvey Fisher as companion. While extensive surveys of the avian populations of regions of northern California have been made in summer, winter data have been fragmentary.

Adjourned.—FRANCES CARTER, *Recording Secretary.*

FEBRUARY.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, February 25, 1943, at 8:00 p.m., in Room 2503 Life Sciences Building, University of California, Berkeley, with President Robert C. Miller in the chair and about 40 members and guests present. Minutes of the Northern Division for January were read and corrected. Minutes of the Southern Division for December, and the list of officers elected at the January meeting, were read. There was one proposal for membership: Helen B. Ray (Mrs. W. W.), P. O. Box 473, Arroyo Grande, California, by Alden H. Miller.

Mrs. Allen reported the singing of a Lutescent Warbler in Strawberry Canyon on February 21. Mr. Pursell reported the recent occurrence of Mockingbirds in north Berkeley at Visalia and Nielsen streets. Warren Fisher added that they had been plentiful in Piedmont Park this year. Vincent Mowbray discussed the change from comparative tameness to extreme wariness of birds around the housing project at Vallejo. R. C. Miller told of the strange coincidence of the death of two Cooper Hawks, within a few days, at the California Academy of Sciences in Golden Gate Park, San Francisco. One had apparently been shot previously. The other struck a window while in pursuit of a small bird, perhaps as a result of the habit of darting through light apertures in dense trees.

As speaker of the evening, Mr. Robert C. Miller presented, "Four Hundred Years of Exploration in the Galapagos," illustrated with moving pictures taken by the Lack-Venables Expedition in 1938. A brief historical outline preceded the showing of the pictures. The longest period ever spent there by a group of zoologists was put in by the California Academy of Sciences Expedition in 1905-6; this was followed by three shorter periods. The Lack-Venables Expedition, on behalf of the Zoological Society of London, brought back the most extensive illustrative material thus far obtained. The moving picture has been organized so as to present some of the most striking examples of speciation in the fauna of the islands.

Adjourned.—FRANCES CARTER, *Recording Secretary.*

MARCH.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, March 25, 1943, at 8:00 p.m., in Room 2503, Life Sciences Building, University of California, Berkeley, with President Robert C. Miller in the chair and about 50 members and guests present. Minutes of the Northern Division for February were read and corrected. Minutes of the Southern Division for January were read. There were two proposals for membership: Paul Joseph Moore, Ohio Wildlife Research Station, Ohio State University, Columbus, Ohio, by Jean M. Linsdale, and Philip L(incoln) Wright, Montana State University, Missoula, Montana, by Alden H. Miller.

Dr. Haley reviewed an article in a recent issue of Nature Magazine, by Donald Thompson, entitled, "Bush Birds Down Under." Mr. Alden H. Miller called attention to a recent article in Time magazine, which told of a lottery established for the closest guess as to the time of hatching of the first albatross egg on Midway Island. It seems likely that more accurate information on the hatching date of these island birds will be obtained this year than ever before, with so many interested observers taking part in the game.

Arrival of the Western Warbling Vireo on the campus, west of Life Sciences Building, was noted by Miss Carter, March 20.

Mrs. Amelia S. Allen then read a delightful account of "a bird trip" covering 40 years and considerable territory—the story of the awakening and development of her interest in birds. Interwoven among the threads of this story were many accounts of places and persons involved in the recent history of ornithology in California. The growing list of species known through field study by song, plumage, and habits was an inspiration alike to serious student and fascinated amateur, told with a charming simplicity and directness of style.

Adjourned.—FRANCES CARTER, *Recording Secretary.*

SOUTHERN DIVISION

JANUARY.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held on Tuesday, January 26,

1943, at 8:00 p.m., in Room 209, Allan Hancock Foundation, Los Angeles, California, with I. D. Nokes in the chair and 12 members and guests present. The minutes of the Southern Division for December, 1942, were approved as read. Four applications for membership were read, as follows: Ruth Emily Coats, 702 E. 1st St., Tillamook, Oregon, proposed by Alex Walker; Louis Edward Hoffman, 5617 Matilija Ave., Van Nuys, California, by George Willett; Richard Allen Reichel, 4265 Crenshaw Blvd., Los Angeles, California, by Sherwin F. Wood; and Miss Belle Wilson, 81 W. King St., Banning, California, by John McB. Robertson.

A letter from Mr. E. P. Kincaid, Encinitas, California, urging the establishment of entire counties as bird refuges was read. After some discussion a motion tabling the proposal was made by George Willett, seconded by Dr. Hildegarde Howard, and unanimously approved. Dr. Nokes welcomed to the meeting two uniformed members, Jack C. von Bloeker, Jr., and Dr. Henry S. Fitch.

The President called for the report of the nominating committee, and Chairman George Willett proposed the following officers for the Southern Division for 1943: Dr. I. D. Nokes, President; Mr. George Cantwell, Vice-president; and Mr. Walter W. Bennett, Secretary. A motion closing the nominations, initiated by Mr. Willett and seconded by Dr. Howard, was passed and the officers as presented were elected by unanimous ballot.

Mr. Willett reported the recent publication of "Joseph Grinnell's Philosophy of Nature" by the University of California Press; this constitutes a compilation of selected papers by Dr. Grinnell.

Dr. Nokes then called for observations by members. Jack C. von Bloeker, Jr., reported watching a Raven imitating P-38 maneuvers in flight on December 15, 1942, on Santa Cruz Island. He also flushed a female Green-winged Teal from Prisoner's Canyon in the same locality. George Willett reported the presence of two Hooded Mergansers at Lincoln Park and a Cackling Goose at Westlake Park. Sherwin F. Wood reported a roaming flock of Western Bluebirds, House Finches, and Audubon Warblers foraging together on January 24, 1943, in La Crescenta.

Adjourned.—SHERWIN F. WOOD, *Acting Secretary.*

FEBRUARY.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held Tuesday, February 23, 1943, at 8:00 p.m., in Room 209, Allan Hancock Foundation, Los Angeles, California, with Dr. I. D. Nokes presiding and 33 members and guests present. Minutes of the January meeting were approved. Applications for membership of the following were read: Chester M. Langenbeck, 315 N. Miller St., Santa Maria, California, proposed by W. Lee Chambers; George Dehnel, 4069 Hilldale Road, San Diego, California, proposed by Clinton G. Abbott; Harold Guyman Higgins, 352 N. 1st East, Price, Utah, proposed by Ross Hardy; and Keith L. Dixon, 7653 Sturgess St., La Mesa, California, proposed by Ken W. Stott, Jr.

Mr. George Willett reported he had several California records of nests of the Chinese Spotted Dove (*Spilopelia chinensis chinensis*), but all were at considerable height whereas information from China indicates they build at any distance from the ground. Mr. James B. Dixon reported two nests of this species near Escondido in recent years situated about twelve feet up in Acacia trees; they contained eggs in May. Mr. George Cantwell reported a nest now in use near his home.

A report on field studies near Escondido, California, entitled, "Life History of the White-tailed Kite" was given by Mr. James B. Dixon, illustrated by Kodachrome motion pictures taken by himself and his son, Ralph Dixon. He observed a tendency of the species to colonize and reported as many as 25 adult birds in one colony. The species often raises two broods per season, the second one frequently being larger than the first. In his studies he observed that mice were eaten exclusively. The female did all the nest building and incubating and there was little mortality in nestlings or fledglings. His motion pictures showed, among other things, mating flights.

Adjourned.—WALTER W. BENNETT, *Secretary.*

MARCH.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held Tuesday, March 20, 1943, at 8:00 p.m., in Room 209, Allan Hancock Foundation, Los Angeles, California, with Dr. I. D. Nokes presiding and 65 members and guests present. Minutes of the preceding meeting were approved. Applications for membership of the following were read: Paul H. Baldwin, Hawaii National Park, Hawaii, T.H., proposed by John McB. Robertson, and Mrs. Ruth Gardner Schmidt, 707½ W. 35th Place, Los Angeles, California, proposed by Frances L. Cramer.

It was decided upon motion to hold the regular annual all-day outdoor meeting of the Southern Division at Tapia Park, 37 miles northwest of Los Angeles, Sunday, May 9, 1943.

The group was privileged to hear a lecture by William L. Finley of Portland, Oregon, illustrated with excellent Kodachrome pictures of birds and mammals. In it he discussed many habits of birds observed in western states.

Adjourned.—WALTER W. BENNETT, *Secretary.*

For Sale, Exchange and Want Column.—Each Cooper Club member is entitled to one advertising notice in any issue of The Condor free. Notices of over ten lines will be charged for at the rate of 15 cents per line. For this department, address JOHN McB. ROBERTSON, Buena Park, California.

BIRD REFERENCE work of any kind done at the U. S. National Museum for distant ornithologists. I have full access to the collections and library. Terms: 50 cents per hour. Address: DR. E. M. HASBROUCK, *U. S. National Museum, Washington, D. C.*

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